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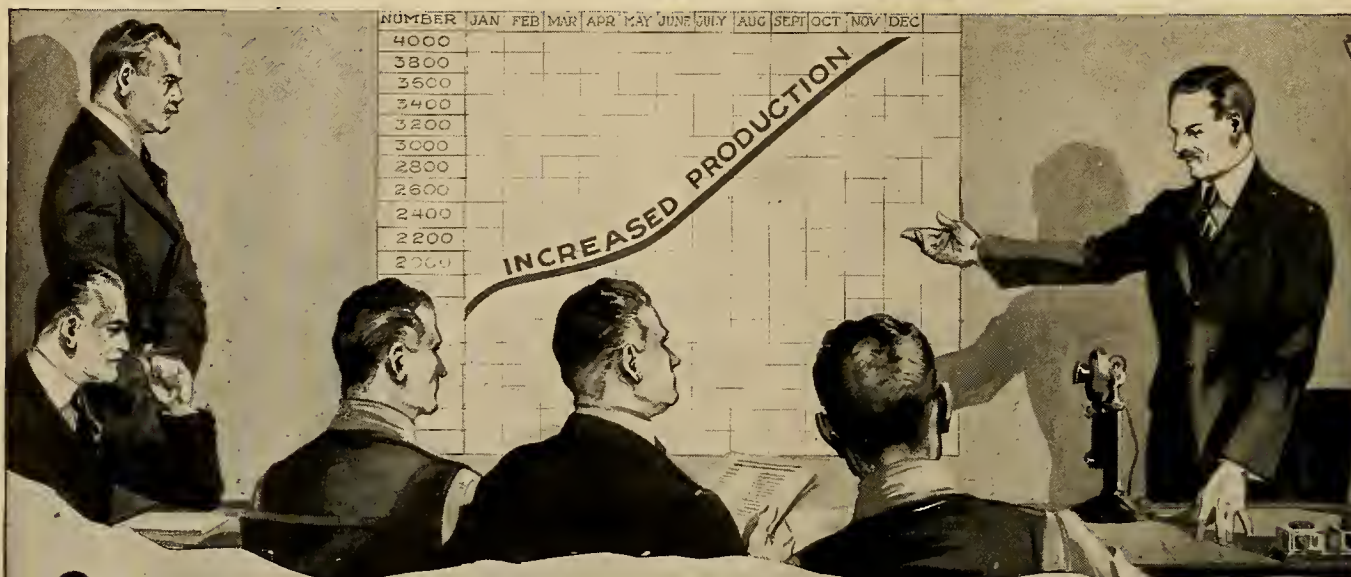
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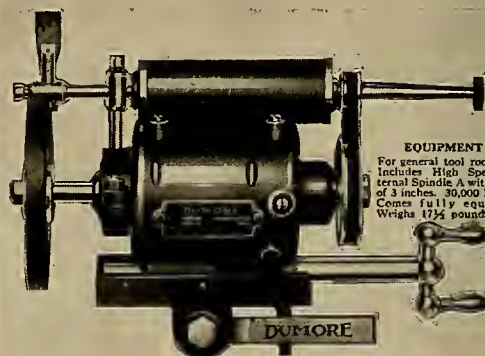
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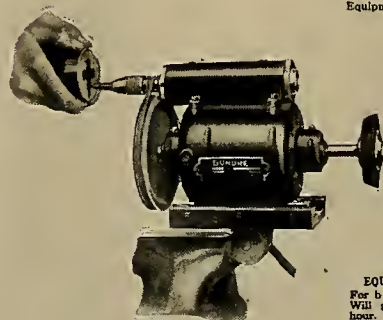
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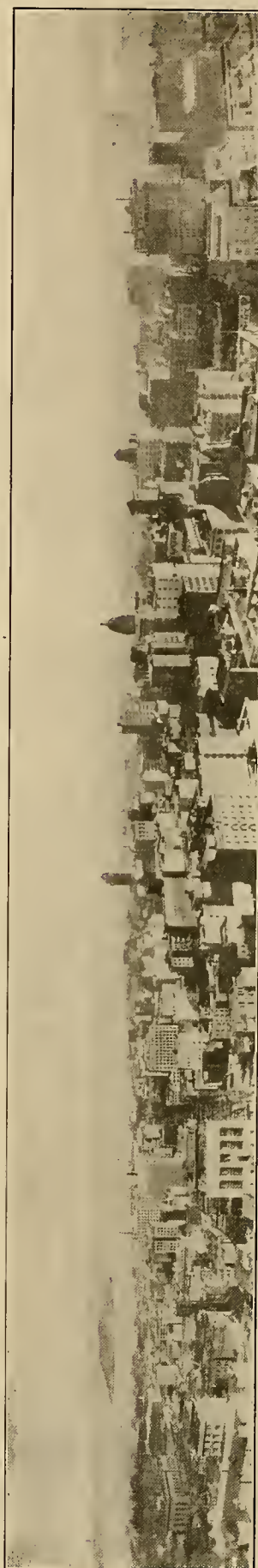
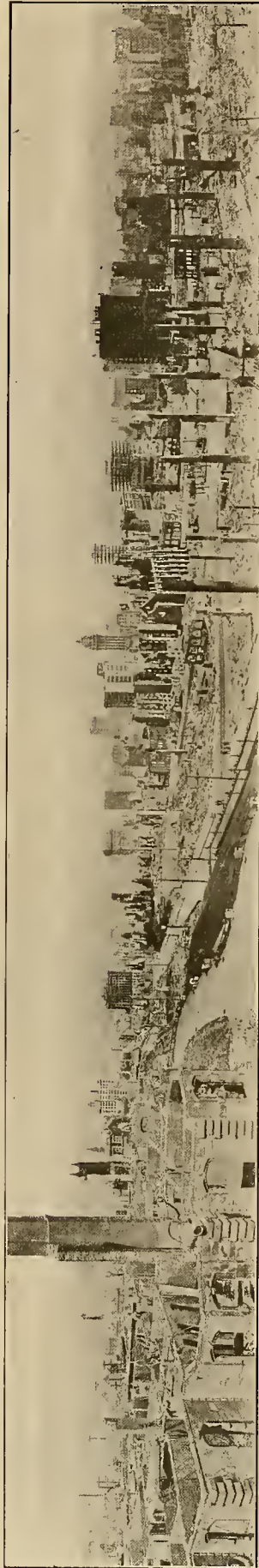
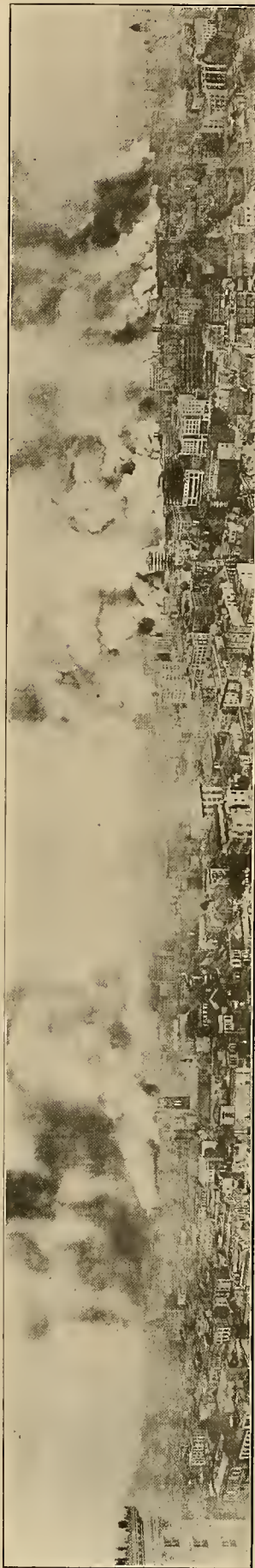
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WHY A SPIRIT OF OPTIMISM PERVADES THE WEST

In April, 1906, San Francisco was swept by the greatest municipal fire in history. Over twenty-eight thousand buildings, valued at one hundred and five millions of dollars, were reduced to ashes or else to gnarled and twisted brick and iron refuse. Today—but twelve years later—the rebuilt city, in which over half a billion dollars has been expended, stands forth as a monument to the bravery and to the daring of citizens of the great West. This is but one instance of what has transpired in the great district west of the Rocky Mountains during the last score of years that have so trained its citizens in the spirit of enterprise and daring as to make them see in the immediate years of reconstruction that now face the world, the most wonderful and promising for the West that it has ever experienced during its eventful life. From Los Angeles and San Diego on up through San Francisco, Portland, Seattle and the inland centers of Spokane, Butte and Salt Lake City a wonderful optimism prevails.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, JANUARY 1, 1919

Number 1

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THE GREATEST RECONSTRUCTION PROBLEM of them all is not in the rebuilding of devastated cities, the launching of a rehabilitated merchant marine, nor in the reestablishing of national bounds, but rather in the readjustment of the human consciousness to think in world terms affecting labor, capital, food and supplies. Are you still engaged with the microscope in magnifying petty local difficulties or is your vision being turned to search the far distant horizon, with due care that the cap is off the telescope and that you are not looking through the wrong end of the transit?

The word "reconstruction" in its literal sense does not enter very deeply into the material life of the United States. We have had no cities destroyed, our political system has not been overthrown, and thank God, our actual loss of life has been comparatively small. We have, of course, our critical problems of readjustment. Capital will have to shift from war to peace time industries, labor must find a new channel as the many war factories are closed and the army disbanded, women must be fitted into their normal place in the shop and office. In many respects we shall never return again to prewar conditions. The spirit of daring and willingness to try new fields will undoubtedly be brought back by the boys—as it has also to a certain extent affected those at home. With big things going on and revolutionary personal histories of friends to contemplate, workers of both sexes have looked to broader fields and have not been unwilling to tear up the conservative roots of years of experiment. This is no less true of capital. The many war inventions which have been made good on the battlefield have fired the imagination of the public—and the money which is freed from war enterprises will be available to finance experiments, some good, some doomed to failure.

In this readjustment, engineering works of reclamation and power development stand out most clearly as national necessities and it is electrical inventions and experiments which undoubtedly will have the larger share among the new enterprises. Some of the larger adjustments which far-sighted men see before us—and suggestions of the best methods of their accomplishment—are reviewed in the following pages by men in close touch with the problems they discuss. There are many radical suggestions made—but in building anew there is little reason for repeating errors and the present is a good time to take count of stock and make improvements.

But beyond these problems of our immediate communities and prerequisite to their solution lies the great problem of world reconstruction. If we have been in large part spared, the world has not—and no lesson has been more forcibly driven home to us than that the world's problem is our own. It is well for us to remember that if the United States might conceivably continue without a league of nations, Europe cannot—and we shall not be more willing in the future than in the past to remain spectators. We cannot afford to consider complacently the possibility of further world wars and prepare for them—we must attempt the removal of the causes of such conflict.

These are not visionary questions, nor ideals without the province of business, but very concrete essentials to the building of our national and local structure. And to no other branch of industry does the burden fall more heavily for building the all-embracing constructive vision that can harmoniously solve these problems than that of the electrical industry. In the West such movements as the California Electrical Cooperative Campaign are beginnings in the right direction. The time for thinkers has come. May the New Year still further bless us with vision to so further this spirit of helpfulness that our energies and efforts will be felt beyond the limitations of provincialism and pass across the seas to bless all mankind in the betterment of a higher, more remunerative, more helpful industry.

With this issue the Journal of Electricity moves to its new quarters, occupying the entire fourth floor of the Electric Building, 171 Second Street, San Francisco. The newness of life and the vigor of its buoyant spirit that have pervaded the activities of the Journal of Electricity during recent months have brought about a splendid growth in its publishing influence and the result is

Moved!

that the old quarters in the Crossley Building have proved entirely inadequate.

The feeling of optimism that is reaching out in every nook and corner throughout the West looking toward great things in engineering and commercial activity for the coming year has led its directors to secure these new quarters, where ample space is provided for its continued growth and the widening of its influence. These new quarters, which are located in the heart of the electrical supply district of San Francisco, should offer to the industry a bigger and broader opportunity for closer cooperation with the industry and its leaders.

The new year finds the Journal of Electricity in the prime of its life at the age of thirty-one years. Its editorial worth is month by month being felt throughout the nation and the engineering and trade press of four continents are liberal in quotations and personal mention of its columns.

The one New Year's resolution and fond hope for the Journal of Electricity is that it may be privileged to continue to hew close to the line in assisting the commercial and industrial development of the great West and the countries bordering the Pacific and that in doing so it may have a part in bringing into existence a healthier, more wholesome and more prosperous district in the vast section of country it so conscientiously serves.

The shortage of power in the West and the high cost of fuel—especially fuel oil—has led engineers in recent months to give unusual thought and study to the use of fuel substitutes.

The Growing Interest in Pulverized Fuel At Portland, for instance, the Northwestern Electric Company is erecting a plant under the able design of C. R. Weymouth, chief engineer of Chas. C. Moore & Company, to burn saw-mill refuse at a very low cost. While there are no fuel economizers installed and the condenser will give only moderate vacuum still by the utilization of this fuel, the plant will be enabled to operate with yearly cost of power that will be a minimum for the particular fuel to be burned. While such plants cannot from their very nature operate at record breaking economies still their use is to be highly recommended from the standpoint of overall cost of power production in the use of fuel substitutes.

Coming down into California, where fuel oil is at a premium, the use of a number of fuel substitutes has been under consideration. At Bakersfield, for instance, the San Joaquin Light & Power Corporation, under the constructive vision of A. C. Balch, is now operating its steam auxiliary plant on natural gas, piped from the oil field some miles distant. This new departure is being watched with considerable interest by engineers generally.

Perhaps the most interest in fuel substitutes is, however, centering in the investigation of the possibility of utilization of low grade lignite coals that are to be found in such large deposits throughout the West. This interest culminated recently in San Francisco where E. C. Jones, the able chairman of the San Francisco Section of the American Society of Mechanical Engineers, and an engineer who has

had considerable experience in the investigation of the use of lignites for the production of producer gas, called a noonday meeting at the Engineers' Club at which time he introduced M. C. M. Hatch, an engineer of the Locomotive Pulverized Fuel Company of New York City, who presented to a thoroughly representative group of engineers an excellent paper on the present status of the use of pulverized fuel.

Mr. Hatch's forecast on the possibilities of the utilization of the lignite fields of California in the powdered form were illuminating and intensely interesting.

According to data furnished from the most reliable sources the lignite deposits of the state of California aggregate, probably, not less than 100,000,000 short tons. It is a valuable fuel although, up to the present time, comparatively little has been done to exploit its general and commercial use. The latent possibilities of this amount of heat producing material may be analyzed as follows: Assuming an average B.t.u. content of 10,500 and a combined furnace and boiler efficiency of 75%, which may easily be attained by proper firing in pulverized form, the boiler horsepower generated would be equivalent to that produced by the use of over 330,000,000 barrels of fuel oil of 18,500 B.t.u. content and at a combined efficiency of 80%.

In other words, if the lignite of the state should be employed as a steam producer, the above quantity of fuel oil would be released for other purposes. Also, the difference in cost, to produce the same number of horsepower hours would be, assuming the lignite to cost \$5.00 per short ton as fired and the oil \$2.00 per barrel, \$160,000,000 or nearly 25% reduction in favor of the pulverized lignite. It would seem that this saving was of sufficient magnitude to be of interest to all concerned in steam production in California.

The entire matter is of such current interest that the use of these lignite deposits in some of the great steam auxiliary power plants of the West will unquestionably prove an early advent in central station operation. In view of this fact an active investigation and installation of a steam electric unit fired by pulverized fuel taken from the lignite deposits of the West is to be hoped for at an early date.

Not the least of the great developments which have been an immediate result of the World's War, and one in which our readers are particularly interested, is that of the application of radio science to telephonic communication.

A New Advance in Radio Communication This application is especially near to the heart of men of the electrical industry in the West, as it has been made not only possible but practical in every-day use as a result of many years' study and work of a California boy, O. B. Moorhead, whose laboratory is situated in San Francisco. The practical form his work has taken has been brought to a high state of perfection, particularly as regards quantity production in the "hard vacuum valve" of the three concentric element type which has been for some time produced at the rate of one thousand a

day for the use of the British and Allied Governments.

For the benefit of those readers who are not familiar with this device it will not be out of place to state that in modern radio this one appliance takes the place of several of the most important details which were previously employed, such as transmitters, interrupters, detectors, tickers, and such vital details as were necessary to make radio communication a practical science.

Primarily the feature which distinguishes the Moorhead apparatus from all others is its uniformity, a most essential feature in quantity production of accurate appliances, and by reason of this uniformity, the apparatus to which the valve is applied has been made under service conditions with practically no forms of adjustment. What this means in huge armies can readily be appreciated by anybody who is familiar with the handling and adjustment of scientific apparatus.

The application of vacuum valves to radio work has been carried on commercially since 1906, and after ten years of hand manufacture of such apparatus and all the experience gained in that time, Professor Fleming, the original patentee of the Hot-Cathode two element valve, stated that no two valves could be made alike, this opinion evidently having been arrived at by reason of the extreme accuracy necessary in all the mechanical and electrical dimensions to which the finished valve must comply.

It is now true, nevertheless, that firms who are making vacuum valves by hand experience great difficulties in the matter of uniformity, and that the amount of rejections for imperfections is extremely high. On the contrary the Moorhead valve, which must pass a very rigid series of electrical tests, has proved its uniformity beyond question, and the percentage of rejections for every possible cause is extremely low.

Up to the present time these valves have been produced to a standard specification to operate all types of radio sets, and naturally such a procedure does not lead to the maximum combined efficiency. Immediate steps are being taken, however, to manufacture in quantity production various standardized types of radio apparatus, each one of which is specially designed around a vacuum valve or combination thereof which will be used as the vital factor in the sets.

By such means an advance will be made in radio work which has never before been attempted or been possible, and the time is evidently near when the attention of the radio world will be turned to the West as the center of advanced thought and development in matters of radio communication.

Men of the electrical industry throughout the West will be interested in the summary of commercial relations with Latin America for the year just past. As shown in brief, the total trade amounts to one and three-quarter billions of dollars, showing an increase over the pre-war period of 1913-14 of 325 per cent — 257 per cent in exports and 214 per cent increase in imports.

But men of the West view with especial interest the fact that the greatest increase in volume and in per cent has been with the great republics of Argentina and Chile, our commercial relations having increased by 240 per cent with the former and 375 per cent with the latter nation.

Such giant growth in commercial and engineering relations with neighbors of the Pacific or countries closely bordering its waters means much for the future industrial and commercial supremacy of the West.

The present crisis has led very properly to a greater respect for the symbol of our national life—the stars and stripes. Each citizen will do well to observe with increasing thoughtfulness the little formalities and courtesies due the flag that tradition has handed down to us.

The Courtesies Due the Flag

Now that the thrill and urge of war has somewhat subsided and peaceful pursuits are coming back into our vision, this courtesy should be remembered with especial emphasis.

One little incident that will long be remembered by those present was brought out at the Del Monte Electrical Convention last May.

The president of the convention, a former captain in the United States Army and a graduate of West Point, would not proceed with the opening of the session until the flag, which draped the speakers' stand, was relieved of the gavel and parliamentary books that rested upon it and until the corners of the flag were properly prevented from drooping upon the floor.

That nothing should ever rest upon the flag with the possible exception of the Bible is indeed a tradition in our national life well worth impressing upon citizens everywhere. Too often this beautiful custom is thoughtlessly overlooked. An instance of this is found in the beautiful poster designs put out recently by the U. S. Food Administration. A poster representing an ear of corn, for instance, upon a flag resting upon a table presents a most effective mental picture, at the same time it violates the time honored courtesy for the flag above referred to.

Too much care can not be exercised in instilling an ever increasing regard and affection for our national emblem.

THE NEW JOURNAL SERVICE: Salvage of the waste is the best way to clear your decks for action in order to make way for the era of readjustment now before men of the electrical industry. As to how the great Southern California Edison Company is accomplishing this task will be featured in the issue of January 15, 1919, by H. N. Sessions, a commercial engineer of this company who has done able and effective work in turning waste material into assets. How the salesman can better his efficiency will be the subject matter of a series of articles beginning February 1, 1919, by H. A. Lemmon, salesmanager of the Truckee River General Electric Company, and a writer of national reputation who has put into practice in a most effective manner the live advice he gives—incidentally, too, he gives it in a way that is highly amusing and edifying.

WATER POWER SITUATION ON THE PACIFIC COAST

BY MAJOR GEORGE F. SEVER

(The power shortage experienced in the West was not wholly a product of the war, except as natural expansion was in some part crippled by the restrictions imposed. One of the vital parts of this period, therefore, is to be the extension of power development to meet the new industries and agricultural growth. The following survey of such projects now in progress in California and others which await development is made by the representative of the War Industrial Board on the Pacific Coast. The paper was one presented before the San Francisco Section of the A. S. C. E.—The Editor.)

The Power Shortage

It was early realized that in California there was a power shortage in connection with the supply of power for war industries, war essentials, public necessities and non-war essentials, this having been brought about by increased demands, and what was more serious, the shortage of water caused by a lack of snow and rain during the previous seasons. Not only was there an actual shortage of hydroelectric generating capacity, but there was also a shortage of steam generating capacity; and besides these conditions there was also a further prospect of a large increase of load during the coming year. Another important factor in the operation of the companies was the increased use of fuel oil at the rapidly increasing prices. The price of fuel oil had risen from 50c per barrel in August, 1915, to \$1.20 in January, 1917, and to \$1.60 in April, 1918. It was desirable to discontinue the use of fuel oil at the earliest moment in order to reduce operating expenses, as well as to conserve the fuel oil supply. In 1917 the three companies serving in the central and northern territory consumed for electric supply only 1,391,478 barrels. If the average price had been \$1.34 per barrel the cost for this fuel supply would have been \$1,864,000 per annum. The consumption of the same three companies for the first 11½ months of 1918 has been 1,998,194 barrels, and if the assumption is made that the rate obtains for the last half of December, the consumption for the year of 1918 will be 2,047,303 barrels. The average price during 1918, outside of earlier contracts, is \$1.55 per barrel, so that the total cost of the oil burned by these three companies is \$3,180,000. Much of this can be saved through the early development of hydro-power. At the average rate of 200 kilowatt hours per barrel of oil, the above amount would have developed 409,460,000 kw-hr. Reference will be made to this in discussing the proposed hydro-electric developments.

A Survey of the Situation

Before reaching any conclusions as to definite recommendations, the author deemed it necessary to make detailed inspections of the important power systems which supplied power to the different industrial centers in the northern and central portions of the state. He also investigated the southern tier of electric power companies to ascertain what their capacity and demands were, and the classes of service which they were supplying. A study of the classes of the consumers showed very clearly that on some systems the largest loads consisted of the electric power supplied to electric railways, while the next in quantity was gold dredging and hydraulic mining, as well as other mining operations. The next in order was the power supplied for irrigation;

then followed general lighting, chemical and powder works, smelters, cement manufacture, iron works, foundries and machine shops, shipbuilding, and last, unclassified factories, but many of these could be classed as essential industries. One of the points in the work is to ascertain the relative importance of the industries which use electric power in those places where there is a serious shortage of power. Where there is a shortage the non-war essential industries are discontinued and the power thus made available supplied to the industries working on war essentials or war industries. In California it appeared that most of the electric power systems were supplying from 80% to 95% of their power output to war industries, war essentials and public necessities, so that it became practically impossible to gain any large amount of electric power for additional war needs through cutting off the very small per cent of power used by non-war essentials. In order to conserve what power there was it became necessary for the Power Administrator for the central and northern part of the state to curtail the use of power in the cement industry, the gold dredging operations and in the electric railway systems by means of skip-stops and decreases in service, and to a small degree by eliminating unnecessary street lights and sign lighting, and introducing so-called "lightless nights." It was necessary to maintain the supply of power for irrigation, chemical and powder works, shipbuilding and iron works, flour mills and other industries supplying war industries and public necessities. A situation developed whereby it became necessary to use fuel oil in large quantities for the operation of the steam stations, in order to conserve the available water which was contained in the natural flow of the streams, and also in storage in those systems where storage was provided. With the rising cost of oil this developed an expensive operating condition, and possessed with the information that oil is liable to remain at the figure it has now reached, there has entered into the problem of electric power supply a new and serious factor which warrants an early and large development of hydro-electric power.

The Regions of Shortage

In laying out a program for meeting the power deficiency it was necessary to consider what could be secured during one, two and three years. It was felt that the war might last at least until 1920, and consequently it was necessary to lay out a program which would provide for power to meet the present deficiency, the natural increase plus the power needed for additional war contracts, and that amount which was deemed necessary to conserve fuel oil as used by the public utility steam plants. It is on the

basis of this program that the developments have been made.

In the first place it was desirable to secure developments which could be made inside a year, then those that could be made available inside of two years, and further, those that might be brought in within three years, thus meeting the above arranged program.

There are within the industrial districts of the central and northern part of the state six important power companies known as the California-Oregon Power Company, The Northern California Power Company, The Pacific Gas and Electric Company, The Great Western Power Company, The Western States Gas and Electric Company and the Sierra and San Francisco Power Company.

There is no shortage of electric power, nor has there been any, on the system of the California-Oregon Power Company, and investigations show that there was no shortage on the system of the Northern California Power Company. There has been a shortage of power on the systems of the Pacific Gas and Electric Company, the Great Western Power Company and the Sierra and San Francisco Power Company, and in the investigating particular attention has been paid to these three companies, as each of them has developments which can be easily and quickly made to meet the program which it is suggested should be followed. Each one of these companies has a fundamental development which is in use now for power supply purposes, and each one has a steam standby service which enables them to carry a portion of their load when there is trouble on the transmission lines from the hydro-electric supply. The steam stations also act as a means of regulating the voltage and for taking the short time peaks on the systems.

The Pacific Gas and Electric System

After a careful inspection of the various developments, the author's recommendations as to the work that should be done on the Pacific Gas and Electric System are the raising of the dam at Fordyce Lake 21 feet so as to allow 11,800 acre ft. of storage, this water being spilled into Lake Spaulding and then put through the Spaulding, Drum, Halsey and Wire power stations, and later in time through a No. 2 station which is recommended to be built. The Fordyce Dam is of the rock filled type, with a wooden facing, and the 21 feet increase in height is the most economical construction that can be secured. If it should be raised a greater height there would be required a largely increased expenditure which is not now warranted.

The second item is the raising of Lake Spaulding Dam 10 feet so as to add 6,423 acre feet to the storage in this important reservoir. The additional water is intended to be passed through the Drum and other stations mentioned above and also the No. 2 station, the construction of which is in contemplation. Besides these two increases in storage capacities, there is what is known as the "Bowman-Spaulding Project," which will add a large storage capacity to the system, and the water would be spilled into Lake Spaulding. The building of a No. 2 station on the Bear River, with a capacity of 25,000 kilowatts will, together with the present stations

and the additional storage, provide 233,000,000 additional kilowatt-hours to the Pacific Gas and Electric Company's system. The cost of these improvements is approximately \$7,200,000. In addition to these hydro-developments on the Pacific Gas and Electric Company's system, there will be installed in Station "A" in San Francisco, and Station "C" in Oakland, the full complement of boilers so as to make the electric generating apparatus fully available. The cost of these steam additions will be approximately \$525,000. Heretofore the practice has been on this coast to equip a steam station with only a sufficient number of boilers to operate generating machinery to give good regulation, to take a portion of the load in case of trouble on the transmission line and to handle the peaks during the so-called rush hours or periods. It is also used to build up load which later can be transferred en bloc to a hydro plant which has been under construction for some time. The table attached shows the details of the proposed developments on this system.

PACIFIC GAS AND ELECTRIC COMPANY PROJECTS

Table 1

Item.	Added Storage, Acre ft.	Additional Energy Available with Pres- ent Installations, Kw.-hrs. per year. (A)	Additional Energy Available after New P.H. is installed, Kw.-hrs. per year. (B)	Total Cost.	Bbls. of Oil Saved per year @ 200 kw.- hr. per bbl.
Construct No. 2 PowerHouse—25,000 kw.			92,500,000	\$5,184,300	462,500
Raising Fordyce Dam 21 ft.	11,800	17,700,000	26,550,000	300,000	132,750
Raising Spaulding Dam 10 ft.	6,423	9,634,500	14,451,700	150,000	72,260
Bowman-Spaulding Project	42,275	69,600,000	99,600,000	1,566,000	498,000
Totals	60,498	96,600,500	233,101,700	\$7,200,300	1,165,510

The Great Western Power Company's System

The next important addition to the power capacity is that of the Great Western Power Company in their proposed development of a 40,000 kilowatt station on the Feather River at Butt Valley. It is proposed to run a tunnel 11,800 feet long from Lake Almanor into Butt Valley, and thence by another tunnel 10,400 feet long to the point of drop into the Feather River, dropping this water 1,155 feet into the power station located in the bed of the canyon. This project will cost in the vicinity of \$6,000,000 and will take about two to two and one-half years to construct.

The following table illustrates the results which may be accomplished by this development.

Table 2

Generating Capacity	Kilowatt Hrs. Generated	Load Factor, %	Kilowatt Hrs. sold to consumers Generated X 75% efficiency
40,000 kw.	350,400,000	100	265,000,000
	265,000,000	75	199,000,000
	175,000,000	50	131,400,000

Improvements on the Sierra and San Francisco System

The Sierra and San Francisco Power Company has its power station and reservoirs in and about the Stanislaus National Forest Reserve and on the Stanislaus River. This company is in a position to supply power at the earliest date. It has two reservoirs in operation, known as the "Relief" (14,965 acre feet) and "Strawberry" (17,900 acre feet). It

has in prospect another reservoir known as "Big Dam" (16,654 acre feet), which would spill its water into "Strawberry." At the present time water from the South Fork of the Stanislaus and "Strawberry" is running in what is known as the "Philadelphia Ditch," at the rate of 50 second feet, which spills from a height of 1,860 feet at Spring Gap into the Middle Fork of the Stanislaus River, and is diverted at the Sand Bar Dam into the present flume to the Stanislaus Power Station. It is proposed to put a power station at the foot of this present spillway near Baker's Crossing containing a 9,000 kilowatt generator, and later, when the size of the ditch has been increased to accommodate 100 second feet, to add another 9,000 kilowatt unit at this point, thus giving 18,000 kilowatts additional development. At the same time an increase in the size of the penstock at the Stanislaus Power Station will gain 7,000 kilowatts which is now lost in friction head. This will make available the total capacity of 40,000 kilowatts at the Stanislaus Station.

There is also contemplated in connection with the North Beach steam station of this company an increase in the boiler capacity so as to make the three 9,000 kilowatt units available for full operation. The cost of these additions will approximate \$3,000,000 and will take from one year to three years for the completion of the individual details.

The following is the tabulation of the developments on the Sierra and San Francisco Power Company system:

Table 3				
Location of Developments and year of completion.	Character of Development.	Increased Kw-hrs. per annum.	Cost Estimated.	Bbls. of oil Equivalent @ 200 kw-hrs. per barrel.
Spring Gap No. 1 1 year	20 mile line 9000 kw.	62% load factor 49,000,000	\$750,000.00	245,000
Spring Gap No. 2 2½ years	generator 9000 kw. generator. Trans. line Stanislaus to Manteca	48,890,000 19,710,000 Stanislaus	400,000.00 200,000.00	343,000
	Increase Philadelphia Ditch to 100 second feet	68,600,000	40,000.00	
Stanislaus Plant	Add new pipe line at plant	15,000,000	125,000.00	75,000
Big Dam	Erect dam at Big Dam 16,100 acre ft.	40,800,000	750,000.00	204,000
North Beach	Boilers to be added to give 11,000 kw.	24,000,000 at 25% load factor	200,000.00	120,000
		Contingencies 246,500.00		
	Totals,	132,600,000	\$2,711,000.00	867,000 120,000 707,000

BARRELS OF OIL USED AND KW-HR. GENERATED BY STEAM 1918, AND KW-HR. AVAILABLE BY DEVELOPMENT

Table 4			
Company.	Kw-hr. Generated & Kw-hr. per barrel.	Kw-hr. from New Developments. Estimated.	Barrels of oil burned to Dec. 15, 1918
			Whole Yr. Est.
10 mos. P. G. & E. Co.	Est. 312,000,000 (268)	Est. 233,101,700	1,136,072.15
			1,168,100.86
10 mos. G. W. P. Co.	92,500,000 (195)	209,000,000	468,547
			472,630
10 mos. S. & S. F. P. Co.	71,700,000 (176)	132,600,000	393,575
			406,573
10 mos. Total,	476,200,000 (232)	565,701,700	1,998,194.15
			2,047,730.30

PACIFIC GAS AND ELECTRIC COMPANY

Table 5A

Date	HYDRO KW.		STEAM KW.		CAPACITY KW.	
	High Water	Low Water	Normal Rating	2 hr. Sustained	Fav-orable	Unfav-orable
	122,600	90,000	75,000	60,000	197,000	150,000
	Max. Kw. Demand	Surplus under Fav-orable Conditions	Surplus under Unfav-orable Conditions			
1917	158,270	38,730	8,270			
1918	174,100	23,500	24,100			
1919	191,500	5,500	41,500			
1920	210,000	13,000	60,600			

GREAT WESTERN POWER COMPANY

Table 5B

Date	HYDRO KW.		STEAM KW.		CAPACITY KW.	
	High Water	Low Water	Normal Rating	2 hr. Sustained	Fav-orable	Unfav-orable
	70,000	56,000	21,750	23,950	93,950	77,750
	Max. Kw. Demand	Surplus under Fav-orable Capacity	Surplus under Unfav-orable Capacity			
1917	75,400	18,550	2,350			
1918	75,480	18,470	2,270			
1919	82,500	11,450	4,750			
1920	87,000	6,950	9,250			

SIERRA AND SAN FRANCISCO POWER COMPANY

Table 5C

Date	HYDRO KW.		STEAM KW.		CAPACITY KW.	
	High Water	Low Water	Normal Rating	2 hr. Sustained	Fav-orable	Unfav-orable
	36,320	10,800	17,000	20,000 (24,000)P	53,320	30,800
	Max. Kw. Demand	Surplus under Fav-orable Conditions	Surplus under Unfav-orable Conditions			
1917	45,270	8,050	14,470			
1918	46,834	6,386	16,134			
1919	50,645	2,675	19,845			
1920	54,645	(Est.)	23,845			

EXPLANATION OF TABLES

Referring to Table 4, there are shown in column 1 the barrels of oil burned for the first 11½ months of 1918, and also the estimated barrels of oil for the whole year of 1918. Column 2 shows the kw-hr. generated by steam as estimated by the companies, and column 3 shows the kw-hr. which it is estimated will produced by the new developments on the three systems. The total of column 3 shows 565,701,000 kw-hr., whereas the kw-hr. generated by steam is 476,000,000. This clearly shows that the proposed developments would more than take care of the steam generated kw-hr. if they were of the same amount in the future, as obtained during the year 1918. More than this, however, is necessary, which should be provided by hydroelectric power.

Tables 5A, B, C and D show for each system and the total combined systems the surplus kw-hr. under the most favorable condition of hydro and steam generation, and also the most unfavorable conditions of the generating capacity. In each case the actual maximum demand for 1917 and 1918, and the estimated maximum demands in 1919 and 1920 are deducted from the best and the worst possible conditions. The difference shows the surplus and the deficiencies in each case.

In Table 5D, which is the summary of the individual columns, there is shown to be in 1919 under the most favorable conditions and without taking into consideration the diversity between the three systems, a surplus of 19,625 kw., which is only 6.05% of the total maximum demand, and under the very worst conditions that would obtain in that year, on the assumption that the water is low and every bad condition is coincident, there would be a deficiency of 66,095 kw. In 1920 the conditions are even worse, unless additional equipment is provided. Actual conditions that

SUMMARY

Table 5D

DATE	Capacity	Favorable		Unfavorable	
		344,270	258,550	Surplus under	Unfavorable Conditions
	Maximum Demand	Surplus under Favorable Conditions	100%		
1917.....	278,940	65,330	20,390		
1918.....	296,514	47,756	27,964		
1919.....	324,645	19,625	66,095		
1920.....	351,645	7,375	93,095		

will obtain lie between the most favorable and most unfavorable conditions, and it must not be understood that the most unfavorable conditions will ever exist.

The deficiency in power during the last year approximated 25,000 kw. for safe operating, and as the normal growth is between 20,000 and 25,000 kw. there is great need for increased generating capacity. Besides this need there is the further need for the replacement of the use of fuel oil by hydroelectric development, and this should be carried out at the rate of about 50,000 kw. per annum until the oil generated power is reduced to a safe and economical value.

Other Power Developments

Besides the previous developments which the writer has definitely recommended on the basis of a war time program, there are many other available power developments, some of which have been carefully considered, which have not been thought worthy of recommendation on the basis of war time service. Among these might be mentioned the projects on the Big Bend of the Pit River, of the Pacific Gas and Electric Company, the Fall River Development, between Fall River and Pit River and its tributaries, and also the various smaller projects on the Pit River; the additional developments on the North Fork of the Feather River, owned by the Great Western Power Company, the first project in connection with the Hetch Hetchy water supply, which will take approximately three years to develop, and other smaller developments which can be secured on the Pacific Gas and Electric Company's system, and also the Western States Gas & Electric system in the central part of the state. There are developments contemplated by the Southern California Edison Company and the Southern Sierra Power Company, as well as by the San Joaquin Light and Power Corporation; and the city of Los Angeles contemplates the development of approximately 21,000 kilowatts in connection with their aqueduct. Without considering the latter project, the total additions to the systems which I have mentioned approximate a cost of \$50,000,000, and so far as his investigations go the writer is convinced that all of this power can be easily absorbed within two years after development.

An entirely new project which has been carefully investigated, is now known as the Pit River Power Company and is intended to develop water at two locations on the Lower Pit River by the construction of two dams, each giving a first possible development of about 32,000 kilowatts. Favorable recommendation was given to this project as its development could be secured at a reasonably early date.

This power project at 60% load factor will give, with 32,000 kilowatts installed at the lower dam site, approximately 168,000,000 kilowatt hours, and with the two installations will give approximately twice this amount. This power will either have to be delivered to the general network through contractual relationships, or delivered by its own transmission line to the industrial centers between Pit River and San Francisco.

At the present time there exist between the companies in and about the Bay district interconnections so that the companies can exchange power between their systems. As the result of a recent meeting of the engineers of the properties, an additional interconnection was found desirable between the Sierra and San Francisco Power Company and

the Pacific Gas and Electric Company near Mission San Jose.

It is also extremely desirable for the companies to arrange for so complete an interconnection of the steam stations, both in San Francisco and Oakland, that there would be need for only one steam station of sufficient capacity to take care of the breakdown service, regulation and the short time peaks on the three interconnected systems. With the present high price of oil and labor the author believes that economies can be secured which would be extremely desirable.

Rules of the Forest Service

The author has made a careful study of the regulations and rules and laws of the Forest Service and the Department of the Interior insofar as they relate to hydro-electric development and control. The opinions in regard to the effect of the present rules and regulations and stipulations differ so widely that it is almost impossible to determine what changes in the present laws, or what recommendations as to alterations in pending legislation, will make for the more rapid development of hydro-electric power. Certainly the main ideas that are undesirable are the revocable permit, the definite franchise stipulation, the matter of just compensation, and the power to be exercised over the complete operations of the company as to conduct and rates. These appear to be the crucial points in all the present legislation and proposed legislation in regard to the power companies. If these can be corrected, the author believes that the financing of the companies and the development of water power can be readily secured.

EXISTING INTERCONNECTIONS

I. In the Bay Region:	
*1. Pacific Gas and Electric Company and Great Western Power Co. at Oakland.....	5,000 kw. at 11,000 v. 12,000 kw. at 60,000 v.
2. Pacific Gas and Electric Company and Sierra and San Francisco Power Company in San Francisco—	
a. Bay Shore—Martin	10,000 kw. at 11,000 v.
b. North Beach—Station F.....	15,000 kw. at 11,000 v.
c. Martin—Bryant Street taken out.....	4,000 kw. at 11,000 v.
d. Martin—Geneva now in Nov. 29, '18....	4,000 kw. at 11,000 v.
3. Great Western Power Company and Sierra and San Francisco Power Company—	
Tie line connecting steam plants.....	9,000 kw. at 11,000 v.
The last connection is temporarily out of service, due to the absence of switching equipment at the Sierra end. Not now in Nov. 29, 1918.	
II. In Other Parts of Northern and Central California:	
*1. Pacific Gas and Electric Company and Snow Mountain Water and Power Company at Santa Rosa	6,000 kw. at 60,000 v.
Nov. 29, 1918, Great Western Power Co. and Snow Mountain Co. at Santa Rosa....	(Not stated)
2. Pacific Gas and Electric Company and Western States Gas and Electric Company at Folsom	3,000 kw. at 60,000 v.
3. Great Western Power Company and Western States Gas and Electric Company at Folsom	1,000 kw. at 22,000 v.
4. Sierra and San Francisco Power Company and Western States Gas and Electric Company at Manteca	2,000 kw. at 30,000 v.
*5. Pacific Gas and Electric Company and Western States Gas and Electric Company at Stockton	2,000 kw. at 2,200 v. (Will be increased.)
*6. Pacific Gas and Electric Company and Northern California Power Company at Chico	10,000 kw. at 60,000 v.
*7. Northern California Power Company and Western States Gas and Electric Company at Junction City	3,000 kw. at 60,000 v.
*8. Pacific Gas and Electric Company and Coast Counties Gas and Electric Company at Davenport	2,250 kw. at 24,000 v. 3,000 kw. at 24,000 v.
At Morgan Hill	
*9. Sierra and San Francisco Power Company and Utica Gold Mining Company at Angels Camp	1,000 kw. at 17,000 v.
*10. There is at the present time under construction between the Sierra and San Francisco Power Company and the Coast Counties Gas and Electric Co. at San Juan.....	Not yet, Nov. 29, '18 3,000 kw. at 24,000 v.
*These interconnections are in daily service.	

New Interconnections

It was the sense of those present that the present plan of the Pacific Gas and Electric Company to temporarily terminate its Wise line at Mission San Jose and step down at that point from 100 to 50 kv. should be completed at as early a date as

possible. Then by the construction of a branch 100 kv. line from Mission San Jose to connect with the main line of the Sierra and San Francisco Power Company, distant approximately one mile, a connection will result between the two systems of sufficient capacity to meet all present requirements.

PRESENT AND PROPOSED CAPACITIES OF POWER COMPANIES IN CALIFORNIA

NAME AND LOCATION OF COMPANY	PRESENT HYDRO		PRESENT STEAM		PROPOSED HYDRO	PROPOSED STEAM		COST OF NEW DEVELOP- MENT \$	TIME OF COMPLETION
	Maximum	Mini.	Maximum	Usable Mini.					
Pacific Gas & Elec. Co., San Francisco	Rated Heating	121600 122600	LowWater 90000	"A" 49000 "B" 5000 "C" 21000	45000 6500 13500	40000 Feather River (9000 Gen. 25000 (9000 Gen. (7000 Gain Stanislaus Rvr. 32000 Pit River	"A" 5138hp. 15000kw. "C" 2468hp. 6000kw.	Boilers \$527,000 Hydro \$7,200,300	No. 2 Sta., 2½ years. Fordyce, Spauld- ing, Bowman, 1 to 1½ yrs. 2 years
Great West'n Pwr. Co., San Francisco	Rated Heating	65000 69000	LowWater 69000	S.F. 20000 O. 10500	15000 10500	15000 10500	None None	\$6,000,000	1 year 5 yrs. for big dam.
Sierra & San Fran- cisco Power Co., San Francisco	Rated Pen-stock	40000 33000	LowWater 10800	N.B. 27000 Boilers only 10402 h.p.	16000 18000		NB. 2500hp. 9000kw. North Beach Sta.	\$2,710,000	2½ years
Pit River Power Co., Sheep Rocks								Without trans- mission line	1½—2 years
Cal.-Oregon Power Co., San Francisco	Rated Heating, etc.	25395 19310	LowWater 16200			Proposed dam, etc. 12500 No. 2 Station Pit River		\$1,541,000	
TOTAL COST								\$20,978,300	
Southern California Edison Co., Los Angeles		116000	87000	106000	77000	113000		\$20,000,000	1½—2 years
Southern Sierra Power Co., Riv- erside, Cal.		85100		8900	?	45600	Cooling Tower	\$6,984,000	1—4 years
GRAND TOTAL COST								\$47,962,300	
San Joaquin Power Corp., Fresno, Cal. (No data included in proposed installations.)									

FEEDING EUROPE AND OURSELVES

A LETTER TO THE EDITOR FROM THE FOOD ADMINISTRATION

Editor Journal of Electricity:

I am glad to note in your letter of recent date your understanding and appreciation of the problems now confronting the world, especially in the matters which pertain to our phase of the reconstruction work.

When the earthquake visited San Francisco in 1906 and destroyed many lives and millions of dollars' worth of property, the first problem presented was to stop further damage by putting out the fires which raged in many sections of the city. But the problem of feeding and clothing the refugees and the rebuilding of the city of the Golden Gate were far more difficult and complicated than those immediately following the catastrophe.

When German hordes swept into France in 1914, they started a world conflagration. The democracy of the world, in order to prevent the destruction of civilization, banded together to extinguish those flames which were fed by misery, starvation and death. The fire was put out by the formal signing of the armistice on November 11th, but the problems of "revitaillement" and rehabilitation are much greater than those presented by the war itself.

The change in the foreign situation necessarily alters the details of our food program because the freedom of the seas from the submarine menace renders accessible the wheat supplies of India, Australia and the Argentine. The total food demand on the United States is not diminished, however. On the contrary, it is increased. In addition to the supplying of those to whom we are already pledged,

we now have the splendid opportunity and obligation of meeting the needs of those millions of people in the hitherto occupied territories who are facing actual starvation.

Our annual pre-war food exports totaled approximately six million tons. Last year we sent 11,000,820 tons of food to Europe. For the present year we will have to export a total of not less than twenty million tons, practically the limit of loading capacity at our ports.

America, by her participation in the war, has accomplished her objectives of self-defense and of vindicating the efficiency of a government in which the people and the people only are sovereign. She has established the foundations of government by the people throughout the enemy countries and this is the real bulwark of world peace. We have yet to build on these foundations. No government or nation can stand if its people are starving. We must do our part if the world be not consumed in the flame of anarchy.

The American people in this most critical period of their history have the opportunity to demonstrate not only their ability to assist in establishing peace on earth but also their consecration by self-denial to the cause of suffering humanity.

Faithfully yours,
U. S. FOOD ADMINISTRATION,
Educational Division,
BEN. S. ALLEN,
Director.

RECLAIMING LANDS FOR THE RETURNED SOLDIER

BY FRANKLIN K. LANE

(The vast scheme of drainage and irrigation planned to care for the employment of returning soldiers is an issue of vital interest to the electrical industry. The labor problem itself is of importance, but in particular these enterprises of reclamation call for electric energy and apparatus in their construction and lay the foundation for new communities with growing electrical demands in their completion. The West has no small share in these plans as is indicated in the following article by the Secretary of the Interior.—The Editor.)

The man who has gone across or is going need not fear for lack of a job at home. Already the Government has plans under way which will insure for every man an opportunity to work at good wages on his return. No one can tell how many of the old places will be ready and waiting for the soldiers and sailors when they have done their bit over there and come home; but no matter how many there may be there is work to be done in the making of America upon which they can be used with profit to themselves and to the country. They have been doing a destructive job, and doing it well, to the pride and glory of our country. When they come back to us they can do a constructive job in the reclaiming of our lands and in the building of homes in the United States for themselves. This is a big job, but a simple job. It is work that must be done some time, and it might as well be done now.

All over the United States there are quantities of lands that are capable of producing cotton, corn, wheat and fruit, which are out of use. Altogether there are perhaps 250,000,000 acres of such lands that in two or three years by scientific drainage or by irrigation or by stumping could be converted into first-class farms.

In the far West, in the arid country along the Colorado river in Arizona, along the Snake in Idaho, the North Platte in Wyoming and Colorado, and near the great rivers of the West, there are millions of acres of lands that can be irrigated, while in the South and in the Northwest there are more than 100,000,000 acres of land that have been logged off but which are lying idle today.

The plan which I have presented to Congress means that we shall put this land to use. That is where the country gains. It means that it shall be put into condition by the soldiers after they have been mustered out. That is where the soldier gains. Every man who has been in the ranks of the army or the navy shall have an opportunity to go on to one of these projects and have a job at the current rate of wages in building a dam or a ditch or leveling land or pulling up stumps, building dikes, clearing land, building houses or roads or fences; and that this shall be done in accordance with the plans which I hope the Government will authorize us to make within the next few months. This means that when the boy reaches New York he goes back home for a time, meets his people, and then is given a chance to take a place in one of the great camps that will be formed for the reclamation of some of this unused land. He gets his wages. Out of these he will pay a certain amount for his board, save enough in a year and a half or two years while he is working to

pay a first installment on a farm anywhere—north, south or west, and have that as his own. It will be a farm that will be prepared—not a piece of wild land, but a farm in a settlement which has its roads already built. It will be a farm already surveyed, fenced, a house and barn built, the land cleared, so that a man can move in his furniture and begin life at once. These farms shall be located upon lands which the Department of Agriculture will approve as suitable for raising certain crops. They will be connected with the railroad, if they are not immediately on it, by good roads. They will have centers, little towns already planned with a good schoolhouse up and ready for the teacher. They will be chosen with reference to the marketing of the produce that will be produced upon them, and they will have administrative agents of the Government who will be advisers as to the methods of farming and marketing. In short, each man can have a job, the Government advancing the capital, and out of the combination of his own labor and the Government's capital he can be given an independent living.

But this is not to be done in the slightest bit of charity, nor is any man to be coerced into taking up the work. It is an opportunity which the Government out of appreciation for the fine service rendered by its boys gives to them. They will pay back the money with interest, but they can pay it back over a period of forty years, and no man is to be confined in his choice to the project upon which he works. The man who drains a great area in South Carolina may choose a farm in Arizona or in Idaho. We have spent \$50,000,000 a day in fighting the boche, and surely we can afford to spend a few days' war outgo in setting up for life the men who whipped the boche. We are planning the reconstruction of the men who come back sightless, armless, legless. They will be in our continuing care. But the men who come back able for work will not ask or expect that they be given anything more than a fresh chance in the world. And that chance they ought to have.

More than 15 million acres of irrigable land now remain in government hands.

60 million acres of swamp land can be reclaimed and made profitable for agriculture.

This work will give employment to thousands of returned soldiers and will provide farms for them on its completion.

It will mean the building up of this country, the establishment of new communities and a growing demand in the West for electricity and electrical wares.

THE UNIVERSITIES AND THE NEW WORLD

BY GEO. F. SWAIN

(Our Universities are educating a good share of our next business generation and it behooves every man to see that they are accomplishing the desired results. The war has brought new vision and the schools and Universities must be readjusted to meet the opportunity. Some of the concrete possibilities of the college in the new era are here reviewed. The author is professor of civil engineering at the Massachusetts Institute of Technology and a past president of the A. S. C. E. He is a Western man and was the Hitchcock speaker at the semi-centenary celebration of the University of California last year.—The Editor.)

Now that the war has been brought to a triumphant close by the overwhelming defeat of the most arrogant and brutal autocracy the world has ever known, it behooves us all to consider seriously the problems of reconstruction which we face. The world will never be the same again. All branches of human activity will feel its effect. Cobwebs have been swept away from men's minds. We have learned that many things which would have been pronounced impossible are not only possible but have been accomplished because they had to be done.

In education, as in other things, there will be changes and improvements. I have long believed that no field of human activity had a smaller percentage of efficiency than education, and the problem before educators will be—unless they disagree and think that we were already efficient—how to improve its efficiency.

The Need of a Motive —

One of the great sources of inefficiency has been lack of motive and interest based upon experience. I maintain that no one is able to assimilate properly a subject which he is studying unless he can relate it to his experience. If he cannot do this the subject will remain vague and abstract in his mind, and he will take little real interest in it; or else, if he does take an interest in it, it will be because he relates it not to his experience but to his imagination, and relies upon preconceived ideas, sentiment or sympathy instead of facts. If a subject is taught in such a way that the student can see its bearing upon his daily life, its value to him, he will study it with interest and understanding, and only then. I believe that most of the difficulty with education arises from a lack of appreciation of this fact.

Consider the subject of Mathematics, for instance. Arithmetic appeals to the experience of every one, for every boy keeps or should keep a cash account and makes change every day. The higher branches of mathematics, however, do not in general appeal to experience, and are frequently taught in a very abstract manner. Probably that is the reason why so many boys hate the subject, and why so many others who think they like it do not really understand it or gain from it much power to apply it. If taught as a tool in connection with its application, and with illustrations drawn from practice and not from fancy, the result would be much better.

History and literature, if treated in the abstract, do little to inculcate real culture, but if taught to show the relation of cause and effect, to acquaint the student with the thoughts and characters of the great men of the past, to show great tendencies of society and not simply the doings of kings, they may be made most interesting and profitable.

Improvements Possible —

The subject of Economics, now carried to such excess in some of our colleges, is a good illustration of the necessity of relating a subject to experience if really good results are to be attained. Here is a subject which deals primarily with great business problems of the highest importance. The young men who study this subject, however, have had no business experience and cannot relate the subject to their experience. They think they are interested in it, because it deals with subjects which they hear so much about, but as a matter of fact they relate the subject not to their experience but to their imagination or their sentiment, and many of them go out of college with vague, erroneous and even ridiculous ideas.

A student finds, for instance, that his professor holds views which are diametrically opposed to the views of another professor equally eminent in a neighboring college, while neither can prove his views correct. The student is therefore naturally under the temptation to rely upon his own preconceived or inherited ideas, and to be governed by these and by sentiment rather than by reason, and to think that his own ideas are as good as anybody else's, because nobody can absolutely disprove them, and because he can find abundant support for them no matter what they may be. If the subject of Economics were taught as many friends of mine teach it, it might be very beneficial, giving the student sane and sound ideas in showing him the fallacies of many current economic notions. But even then he would run the risk of having his equilibrium disturbed by finding that the views of his professor were widely disputed.

Some branches of economics may be related to experience, such for instance as bookkeeping and accounting, fundamental notions with reference to the promotion and organization of an enterprise, various forms of securities, the functions of a bank and what it will do and how it can be used by a young man, and the elementary principles of business law. I know from experience that these subjects can be grasped and appreciated by a student, while subjects such as railroad fares, labor problems, the tariff and many others are quite beyond anything but his imagination.

Impetus to Engineering Study —

The war has been a war of engineering, and has been won by the use of engineering appliances and methods. The aeroplane, the tank, the submarine, wireless telegraphy, and all such applications of science have played the principal part, aside from the human energy which has directed their application. The thoughts of our young men are directed as they

never have been before toward engineering in its various branches. I believe, therefore, that the effect of the war will be to give a great impetus to engineering education, and that our engineering schools will be sought by multitudes of young men who will prefer the practical and definite education which it affords to the more vague, uncertain and less immediately useful opportunities offered by a college course. In all of our schools, however, I think more attention will be paid to making the courses practical, immediately useful, and related to the experience of the student. The great motto will be to motivate the work, that is, to make the student see its bearing and its immediate value, so that he will study it with greater interest and from the concrete point of view rather than the abstract. Efficiency must be introduced into our schools. Even courses in general subjects like English and Economics should be, and, I believe, will be taught in a manner different from that heretofore pursued, by making them more fundamental, confining them to subjects related to the student's experience, and omitting those which are not so related; in other words, by motivating them.

Clearing the Curricula —

Every college student knows that there are many courses given which are practically useless. We have crowded our curricula with every conceivable subject of human interest regardless of whether the student could relate them to his experience. We have confused putting a subject into the curriculum with putting it into the student. We have confused research with discipline. Research has no place in an undergraduate course, and very little in any academic course. The students are not sufficiently trained to be able to make researches in the proper sense of the work. Researches should be conducted by trained men after they have graduated, in special institutions or special branches of our colleges.

In connection with college work the great aim should be to make the student think. Most students, and most men and women do not really think. They are easily led astray and made to believe whatever seems plausible, and they like to be deceived by others and by themselves. They would rather face pleasant falsehoods than unpleasant truths. The scientific attitude of mind, which leads a man to come to no conclusions until he has first gathered the facts, made experiments if necessary, and carefully considered the subject in all its bearings, is comparatively rare. Impracticable ideals are pursued, and social and economic schemes are proposed with the purpose of remedying some defect, without realizing that the proposed scheme, while it may remedy that defect, will substitute others which are worse.

Safeguarding Democracy —

At the present time nothing is more important than clear thinking. The war will result in a great increase or flood of democracy all over the world, and, now that autocracy has been defeated, the tendency will be for us to think that our troubles are at an end. History teaches, however, that democracy is not inherently superior to autocracy. It depends upon the kind of democracy and the kind of autoc-

racy. Liberty may exist under an autocracy and not under a democracy, and the two watch words of democracy, namely, liberty and equality, are mutually exclusive. Where there is liberty there cannot be equality, and where there is equality there cannot be liberty. Tyranny may exist in an autocracy or in a democracy, and the tyranny of the many may be worse than the tyranny of the few, because responsibility is less concentrated and there is less dependence upon individual conscience.

Autocracy has been overthrown in Russia. Is the democracy which has succeeded it any better? Not so far, though we hope that it will be in the future. Autocracy was overthrown by the French Revolution, but in the popular rule which followed it crimes were committed and liberty infringed to as great an extent, if not greater, than exhibited by the Germans in the recent war. Probably the happiest periods in the world's history have been under autocratic government.

Liberty and Government Ownership —

We are apt in a democracy to think that we govern ourselves. As a matter of fact, under any government we are governed, perhaps by one man, perhaps by a few, perhaps nominally by a majority of voters, but in any case really by a few. Democracies have existed in the past, as advanced in civilization, except in material things and the application of science, as our own, and they have crumbled into dust and have been succeeded by autocracy. We must not deceive ourselves by thinking that the same thing may not happen again or to us. It was a wise statesman who said that eternal vigilance was the price of liberty. Liberty does not consist of the privilege of going to the polls once a year and voting. Liberty exists when all men are equal before the law; when the administration of justice is impartial; when the individual man is free to do as he pleases so long as he does not injure others, and is punished when he does injure others; if he is protected in the possession of all property that he can legally acquire, encouraged to develop his powers to the utmost, and assured of the possibility of rising to any position commensurate with his ability and character.

If the private property of individuals is taken by the state against the wishes of the owner and without public necessity, for taxes, or these are assessed upon one class for the support of another class; if one class are dependent upon the government and another class pays the taxes, liberty does not exist, initiative will be stifled, and prosperity will depart. This is the tendency of public ownership, which means management by politicians.

Education the Hope —

There are tendencies in this country today in these directions, and many of our most capable, thrifty and thoughtful citizens are profoundly discouraged with the outlook. Whether their fears are justified the future will show. The American people are better fitted than any people that the world has ever seen for self government, and, while they have made mistakes, they have generally corrected

them before it was too late. It does not follow, however, that they will always do so, and it behooves us at this time more than ever before, when the flood of democracy has been loosed and when, as I have said, there is a tendency to consider our problems as solved and our liberties as safe, to take thought of the future, to recognize our dangers, and not to allow ourselves to be deceived by the demagogue, by the one who poses as the friend of the

people, or to be misled by fine phrases and moral sentiments. That our people may be educated to a true and sane view of things, and that the destruction of autocracy may not be succeeded by a democracy which will be worse, must be the earnest prayer of every good American; but it seems inevitable that in many countries there will be a period of great disturbance before a state of equilibrium is reached.

TRANSPORTATION AND WESTERN POWER PROBLEMS

BY JOHN H. LEWIS

(A suggestion from a Western engineer of what might be done by railway electrification and the development of our navigable streams and their latent water power which opens vast possibilities. The paper of which an abstract is here given was taken up before the Utah Society of Engineers and local section of A. I. E. E. by the author, who until recently was State Engineer of Oregon.—The Editor.)

The development of the West, with its peculiarities of climate, topography and natural resources, is primarily dependent upon transportation and market facilities.

Our population is limited. There is thus no demand for agricultural or industrial development in excess of local needs, unless rail and water rates are such as will permit profitable shipment to other markets. The loss of potatoes in Idaho, apples in Oregon, and other produce from the West during the past year, through lack of cars, will discourage production, unless some relief is assured. This can only come through improvements in rail and water transportation facilities, now under national control. We should, therefore, see to it that any changes which are made in our national transportation policies will fit our local conditions and needs.

The recent coal famine has brought forcibly to our attention the need for some reform in transportation policies. Prior to the Federal Government's taking over the railroads, it is claimed, extensions and improvements in service were not made, because of the unwillingness of our public officials to permit the average road to earn reasonable returns on the capital invested, lest the more favored roads earn unreasonably large profits. Now there is danger that the private owners will not plan necessary extensions and improvements because of the uncertainty as to whether or not the roads are to be returned after the war. There is also danger that the Federal Government will not be prepared to make these improvements, in case the people demand that ownership be retained in the Federal Government.

Revolutionary changes are taking place in England, to work out certain national economies. Recently, the British Ministry of Reconstruction approved a scheme for supplying cheap electrical power to all industries in Great Britain from 15 "super-power stations." It is estimated this change will save \$500,000,000 annually. While conditions in this country are not comparable to those in England, and such a plan doubtless would not be feasible except in limited areas, yet there are other fields in which great reforms can be worked. Some of these are believed to be beyond the reach of private capital, and it appears necessary that Federal aid should be had. It is not urged that the Federal Government

enter any field now adequately served by private capital, or which is within reach of private capital in the near future, but rather to do those things which private capital cannot do, in order to open new fields for both capital and labor.

Railroad Electrification

An analysis of our coal situation will show that the recent coal famine would have been averted, had our important railway systems been electrically operated.

We are now using more cars to haul coal than any other class of railroad freight, according to the best information available. Coal constitutes approximately 25 per cent of all freight carried, employing 900,000 cars, which carry more than 42,000,000 tons at one loading. Even in the eastern part of the country, where the haul from mine to factory is short, it is said to constitute 33 per cent of the total tonnage.

Several leading authorities agree that approximately one-fourth of all the coal mined in the United States is used for running the railroads. This amounts to 150,000,000 tons for 1917. It is burned under such inefficient conditions that 6 lb. of coal is required to produce one horsepower hour. The same coal in steam turbines would produce three times the amount of power in the motors of an electric locomotive, according to Mr. Rice, president of the American Institute of Electrical Engineers. One-third of this coal, or 100,000,000 tons, could thus have been saved in 1917, if the roads had been electrified. This is more than three times the total coal exports for that year. Such a saving would easily have averted our disastrous coal famine.

Where electricity has been substituted for steam, in the operation of railroads, fully 50 per cent increase in available capacity of existing tracks and other facilities has been demonstrated, according to the same authority.

The best results from electrification can be had only on railroad systems, where there is a heavy and continuous freight and passenger traffic, and especially in the western mountainous country, where the grades are steep and continuous.

The Butte, Anaconda and Pacific Railway and the Chicago, Milwaukee & Puget Sound Railroad,

both electrically operated, are examples of the latter class.

Most of the roads in this western mountainous region are single track. Some of these are nearing their traffic capacity and are considering double tracking. The cost of doubling the capacity of the single track, through electrification, is less than one-half the cost of additional track for steam operation, according to an eminent authority.

Water power is abundant in the West, and the arguments for electrification are well known and appreciated. But owing to the difficulty of enlisting new capital in the past, or for other reasons, these reforms have not been undertaken.

The production of electric power from steam turbines utilizing coal burned at the mine, where water power is not available, would doubtless prove economical on many roads in the East. In these districts great quantities of coal are also consumed by small, inefficient plants in the production of power for industrial purposes. Authorities state, during the last ten years, the cost of coal has risen on an average of one per cent per year, while the cost of electric power produced from coal in large plants has fallen on an average of $2\frac{1}{2}$ per cent per year. The adoption of more efficient methods of power production will eventually be forced by this increasing cost of coal.

A careful study of all facts bearing on this subject will doubtless show that in certain sections, at least, it will be found advisable to institute some of these reforms in the near future. The doing of this will provide work for our returning soldiers and discharged munition workers, and will go far towards meeting industrial competition from England and other countries.

Navigation Policy

To relieve the congestion of our railroads water transportation should be fostered and encouraged by the Federal Government.

With a general policy of railway electrification decided upon, the question of canalizing our rivers so as to make deep slack water pools, through the building of dams, is thus greatly simplified, for a market would at once be available for much of the power created by such dams.

In addition to this possible market for such by-product from a proper navigation policy, there are many new electrolytic and electric furnace industries which require large quantities of cheap power for successful operation. These should afford a profitable market for much of the surplus power that would be developed incident to navigation.

Conditions in the West

Conditions in the West, and particularly in the Columbia River basin, are different from those in most other sections of the United States. Here we have enormously undeveloped resources, in a great area with limited population. With the development of inland water transportation and corresponding reduction of railway freight, we have an opportunity to develop great industries at the point where these inland rail and water transportation lines meet ocean transportation facilities. These are the conditions which have led to such a rapid development of the

water powers of Norway. Any resources which are lacking can be had at this point as return ship cargoes from foreign countries. The recent completion of the government railway to the coal mines of Alaska, and opening of the Panama Canal, lend hope that this development will occur as soon as we have solved our inland navigation problem.

The presence of great undeveloped water power resources is one of the important points in which the West differs from other sections. Here we have over one-half of all the water power in the United States in small area west of the Rocky Mountains, according to U. S. Geological Survey reports.

The Columbia River is second only to the Mississippi River, when we consider navigable inland waters of North America. It differs from the Mississippi however in this important particular: The distance from the continental divide down the Snake River to the Pacific ocean is only about one-third the distance down the Yellowstone and Missouri rivers to the Gulf of Mexico. This accounts for the fact that there is more water power available in the Columbia River basin than in any other similar area in the United States.

The Columbia River is therefore of more value for water power purposes than the Mississippi, but of less value for navigation without extensive improvements. The stream is now navigable for only high power, swift water boats, and not navigable except in isolated sections for small boats towing great fleets of loaded barges as on the Mississippi River.

Experts agree there is no possibility that future water traffic will ever justify the building of dams to aid navigation under the present policy of direct appropriations unless we can find some use for the water power thus created. Any policy which will ultimately make this river navigable for heavily loaded barges should be of particular interest to the great inter-mountain country, as it will compel a material reduction in railroad freight charges and thus promote development of many industries, which would not otherwise be commercially feasible.

These navigation dams should be built only as fast as a profitable market can be found for the water power developed incidentally thereto. The firm dam in the Columbia River should be built at the foot of the first rapids, near Bonneville, 42 miles above Portland, the metropolis of Oregon, and 143 miles from the Pacific ocean. Here a head of 44 feet would develop 200,000 continuous horsepower, and an equal amount of part time power. This dam would drown out five miles of swift water immediately above, through which all river boats must now pass to the entrance of Cascade Lock. The slack water pool created by this dam would extend up-stream 45 miles to the next obstruction, which is above The Dalles, or 190 miles from the mouth of the river. Here a 105-ft. head can be secured with the development of 480,000 primary and 320,000 secondary horsepower. This project would in turn create a slack water pool extending 30 miles farther up-stream. In the vicinity of this point 500,000 additional horsepower could be developed by private capital in small plants along the Deschutes River, if a profitable market for such power could be found.

A NATIONAL DEPARTMENT OF PUBLIC WORKS

BY C. E. GRUNSKY

(So much of the reconstruction work planned for the immediate future is engineering in its character that the question of the establishment of a department of public works to be represented in the President's cabinet is one of much timely interest. Engineering work at present is carried out under five different departments with as many special bureaus and commissions. Undoubtedly much could be gained in efficiency and effectiveness by a reorganization as suggested below. The author is a well-known engineer of San Francisco who himself has done much engineering work for the government, both on the Panama Canal and later as consulting engineer for the Department of the Interior on the Reclamation Service.—The Editor.)

A Time for Readjustment —

Every branch of the engineering profession should exert its influence in shaping the readjustment to peace conditions. Would it not, therefore, be timely to again give serious consideration to the establishment of a Department of Public Works? Let us look back for a moment to the situation before the resources of the nation were pledged to the winning of the war. A bureau system had grown up, which has its advantages but which can perhaps be replaced, along certain lines at least, by something better. In the matter of public works let this be briefly considered.

The Growth of the Present System —

Some 30 to 40 years ago the U. S. Geological Survey, a bureau in the Department of the Interior, under the able and far-sighted leadership of Major J. W. Powell, undertook the work of stream gaging. Small appropriations were made from time to time by Congress for this work and more or less fun was poked at the geologist for including the determination of available water among the studies supposed to relate more particularly to the mineral resources of the country. A little later the Geological Survey sought the cooperation of the individual states in this study of water resources and thereafter did the most work in those states which, recognizing the importance thereof, would contribute to its cost. The data collected and published by the Survey, largely under this system of cooperation, have proved invaluable to the engineer who is now fairly well informed on probabilities of stream flow and can make, with more or less allowance for departure from probabilities, the necessary deduction relating to the extremes of flow. A very valuable work has thus been done by a bureau operating somewhat beyond its natural sphere and this work is being continued and deserves approval. The engineers of today are thankful that it was commenced long ago and those of the future will feel grateful for its uninterrupted continuance and extension.

Many Departments Represented —

When this country entered upon a program of federal aid to irrigation enterprises involving examinations and field studies, reports, plans, cost estimates and construction, there was no department to which such works would naturally fall. A new bureau was created, the U. S. Reclamation Service, first considered as an offshoot of the U. S. Geological Survey and placed under the Director of the Survey, but now independent of the Survey and directly under the Secretary of the Interior. The staff of

this new bureau was largely recruited from the engineers who were already in the employ of the Survey.

About the same time plans were made for the handling of construction work at Panama. Commission after Commission had theretofore been appointed to give consideration to the best location for a canal. The question now arose who should take charge of construction. As there was no appropriate department a Commission was authorized and an independent organization was established that did not fit in anywhere. But, it was convenient to have the same attached to one of the executive departments and the President directed that it should act under and report through the Secretary of War.

The river and harbor work of the country has long been in charge of the engineers trained at West Point. In times of peace these engineers, under the Secretary of War, are assigned to various stations throughout the country and have charge of all problems relating to the betterment of river navigation, canal construction and harbor improvements. In this body of engineers and their system of organization, it seems probable that the best nucleus of a Department of Public Works will be found.

The coast and geodetic surveys are directed and conducted by a bureau under the Secretary of Commerce. The Department of Agriculture has long been hoping for a bureau of construction to undertake the reclamation of swamp and overflowed lands of the country, in the same way, and with the same liberal aid as was accorded by congress to the reclamation of arid and semi arid lands.

The planning and erection of public buildings is in charge of a bureau of architecture under the Secretary of the Treasury.

A Department of Public Works —

Whenever a suggestion is made that all of the bureaus concerned in any way with affairs related to public works, such as above enumerated, be combined in one department, the opposition of these bureaus becomes vigorous. The claim is made that each thereof, working independently, can accomplish more and do its work better than if working under one head, in cooperation with the others. We have been getting along under the established system, why experiment with a new one? The establishment of a Department of Public Works would mean the association with the Engineer Corps of the United States army a host of civil engineers, who would necessarily be given the same rank and standing as the army engineers—an idea which is more or less repugnant to the man whose principal training has

been along military lines. And so, though often suggested, nothing has come of past attempts to have a Department of Public Works created with a member of the Cabinet at its head. Nevertheless, the country needs such a Department. There is more public work now to be done than ever before in the history of the country. Thus, for example, the United States should be committed alone or in cooperation with the several states to the construction of storage reservoirs. From such reservoirs under federal or state control the needs of irrigators can be met; water can be furnished to municipalities and for power; navigation can be benefited and in some measure, too, the flood menace on many streams can be reduced. The projects of this kind to be first constructed would naturally be those which offer the best prospect of an early return of operating expenses. Who, then, shall determine the question of physical and economical feasibility? Possibly the United States Reclamation Service—better a federal Department of Public Works. Or, as another illustration, we are told that there are some 60,000,000 to 80,000,000 acres of swamp and overflowed land which can be made available for cultivation by suitable drainage and protection works. Who shall determine the feasibility? The Department of Agriculture through a swamp-land reclamation bureau? Or, why not again, a Department of Public Works?

Such a department is a logical feature of such a government as that of the United States; it would be regarded as a necessity if we were starting anew; its organization at this time would be timely. Why not consolidate some of the duties of the other cabinet members and make room for a Secretary of Public Works? Why not use the Engineer Corps of the U. S. Army on the engineering staff of such a Department? Why not let every graduate of an accredited engineering college have the right to become a member of this engineering staff with equal rank and standing as the West Point graduate? Why not do it now in this time of readjustment to peace conditions?

MEETING THE IMMEDIATE PROBLEMS IN THE WEST

BY A. G. WISHON

(A view of some of the more personal problems which confront the business of the West, always with a background of national and international adjustments—by the general manager of the San Joaquin Light & Power Corporation.—The Editor.)

The war is over. And what next? That is the big question before us today. Before going to Europe President Wilson said, significantly, that a peace must be made to insure the freedom of the peoples of the world, and not for the selfish advantage of a solitary nation. It will be a peace to enlighten the down-trodden individual, a peace whereby the fortunate will come to the aid of the unfortunate, a peace that will make this world a better place in which to live. What this means is not appreciable generally to the populace of the United States. Only those who have come from Europe or have visited there and studied the economic conditions of the separate nations can fully understand the stupend-

ous problems that are to result from the sudden liberation of millions and millions of people who, until this time, in the category of European castes have been distinguished only as the masses, or the serfs, or the "common people." Their transmigration from a state of bondage to one of freedom is now being attended with revolutions and upheavals; what is yet to come can only be guessed at. And it remains for a sane, level headed, clear thinking, liberty loving and experienced people like those of the United States to hold the balance—to bring order out of chaos.

However foreign this may seem to us, nevertheless it is an integral part of our existence. The troubles of Europe are our troubles. We have been of service to mankind through our war efforts and even though the war is now behind us, we are in reality only getting up steam for the performance of our duty to a suffering world. Upon the United States rests the responsibility of rehabilitating a stricken people. It is up to us to roll up our sleeves and make the dirt fly. We want to look our problems squarely in the face, get them out of the way and perform the task before us with the greatest efficiency for all parties concerned.

We have of necessity to care for our own people. To keep them in such fitness of body and mind that they can keep abreast in this terrific race now on, is the problem and responsibility of the government and every employer. Work, work and still more work amid satisfying surroundings is the answer. The sooner we get our big work started and business again under way in every line of endeavor, the better it will be for us all. There will be work enough for everybody and I believe that if we only put our minds to it and use our pencil, we can figure out a method that will make everyone satisfied and everyone determined to put forth his best efforts.

My thought is, to make every one of your employes interested in your business. How this can best be accomplished is for you to decide. Some of us can best give annual bonuses; others endowments; others pensions for long service; others sick or death benefits, and still others an actual monetary interest in the business, permitting the enjoyment of dividend earnings and other advantages in addition to the usual wages for service rendered. This is certain to be the solution of many economic problems. To me the plan of every employe a partner appears to be the ideal plan. By it you will have the three vital factors of your business tied in together: the stockholder, the organization and the public you serve.

The biggest problem now before the country is that of the resumption of development and of business in every line of endeavor. The labor situation vitally depends on such resumption, and otherwise there is need of the production itself to supply the demand at home and abroad. We shall get back to a normal basis quickest by such development and both capital and labor will be best served thereby. But in getting back to this basis let us lose sight of all selfish motives and shape our plans for the future welfare and betterment of the condition of those whom it is our duty and privilege to serve.

AMERICA AND RECONSTRUCTION IN EUROPE

(The rebuilding of cities and industries entirely destroyed, as there are so many in Belgium and northern France, means electrical construction on a wholesale scale and with possibilities of uniformity and foresighted planning which present a fascinating problem. Not only will American industry and American engineers have a part in this work but the rehabilitation of science and industry in these countries brings forward much which may serve as an example in our own problems of readjustment.—The Editor.)

ELECTRICITY A FACTOR IN RECONSTRUCTION IN FRANCE

The reconstitution of economic life in the invaded regions of France will not be possible without having recourse as largely as possible to electricity. The directors and representatives of the large central power stations and electric-lighting plants situated in the invaded regions are already engaged in studying the problem of reconstructing their central power stations. They have already marked out the broad outlines of their plan, as follows:

Probable Extent of Destruction and Plans for Restoration

Those interested, as a technical committee, have been brought together. The data in the possession of this committee indicate that the power stations existing in the regions occupied by the enemy represented electrical energy, including units in process of installation, that did not fall far short of 300,000 kilowatts. From the information gathered by the committee, it is only too evident that in the immense majority of cases the electrical machinery, boilers, transmission lines, and in many cases the buildings themselves have been destroyed. It seems prudent, therefore, to face the necessity for replacing practically the whole electric-generating installation in the invaded regions. However, in order to avoid, on the one hand, undertaking a program which would be too ambitious and which would attempt to re-establish at one stroke the electrical situation as it existed before the war, while, as a matter of fact, the reconstruction of the invaded regions will without doubt demand several years, and to avoid, on the other hand, adopting a program so restricted as to cause cruel disappointments to those interested, the electrical committee has agreed to limit its plans—for the time being at least—to the restoration of one-third of the energy of the period before the war. This involves the restoration of 100,000 kilowatts.

Standardized Equipment Favored

Those interested are agreed that since they will undoubtedly find themselves face to face with a clean slate so far as the old plants are concerned, advantage should be taken of the opportunity for securing as largely as possible the standardization of new equipment and transmission systems. The adoption of the principle of standardization would make it possible for those interested to help one another most effectively because the machinery available would be capable of being used in one place as well as another and could be transported from point to point. The adoption of this principle of standardization would also permit the manufacture of the electrical equipment in series, which would naturally result in lowering the net selling price. It is true this process of standardization would impose sacrifices on certain of the electrical societies interested,

but nevertheless they have not hesitated, in the interest of the invaded regions as a whole, to adopt a single type of generating apparatus. It will be a turbo-alternator group of 5,000 kilowatts supplying three-phase current at 50 cycles per second at 10,500 volts.

In order to develop as quickly as possible the desired energy of 100,000 kilowatts it would be necessary to provide for the installation of 20 identical sets, such as were mentioned, each one equipped with its own boiler plant, switchboards and distribution lines, with the necessary transformers and distributing apparatus.

Location of Generating Sets

An important question is, Where would these new generating units be installed? The object in view being to furnish electric current in the invaded regions as speedily as any part of them has been liberated, it seems obvious that the first equipment would have to be installed in temporary central stations. These temporary stations would in some cases be designed to reinforce central stations already in operation on this side of the firing line. A part of the new installation would perhaps be left in reserve in order to be ready for installation in strategic locations in the regions still occupied by the enemy the moment their liberation has been brought about. These locations, naturally, can not be fixed definitely at this moment; they depend upon future events.

Methods of Distribution

Another question to be answered is, How will the electric current be distributed? Will it be by the existing transmission systems that may eventually be recovered? The object, of course, will be to satisfy the collective needs of the liberated regions as effectively as possible. In spite of the uncertainty with regard to the conditions in which the liberation of the invaded territory will be brought about, it is absolutely necessary to provide for the most effective distribution of current, no matter what locations may be chosen for the generation of the current. In this connection the electrical committee thinks it much better to leave out of consideration the old transmission lines, for the chances are that all the copper wire has been either destroyed or carried off by the enemy. Moreover, even if part of the old transmission system should be found intact, it would probably not be capable of use. For one thing, the old lines were arranged for supplying local communities and were not designed with the object of tying up in one system the various zones requiring electric current on the basis of the proposed new central stations. Undoubtedly the old transmission lines would not be of much use in meeting the need of the future. It is wiser, therefore, not to place any reliance upon their utilization. On the other hand, the new lines that must be constructed in order to assure

the proper distribution of current can not be determined without taking into account the distribution of current before the war.

To aid in solving this particular problem there has already been worked out a map showing the distribution lines existing in 1914. In addition a new map has been prepared, indicating in a general way the transmission lines that will be necessary for the distribution of energy in the invaded regions after the war. The provisional and theoretical transmission lines that have thus been sketched out have been developed purely from the point of view of the general public interest. No account has been taken of the more restricted interests of electric companies themselves and their individual consumers. The transmission lines contemplated by the committee have been classified in various categories according to the urgency of their installation.

Efficiency From Large-Scale System—Government Aid

By the creation of a vast system of power generation and distribution established in accordance with a general plan carefully laid out and capable of realization by successive stages as the needs of the invaded regions may dictate, the committee hopes to achieve the maximum efficiency by avoiding the creation of numerous small private central stations, which are for the most part not economically efficient. Moreover, the scientific use of fuel in the projected large central stations will prevent the waste of coal that it is impossible to eliminate in small installations.

Needless to say, in realizing this plan the support of the French Government, as well as of private parties, is absolutely necessary. It is desirable for all those interested, including manufacturers, farmers, municipalities and villages, public institutions, etc., and the public generally to be familiar with the program in course of elaboration, so that they may be in a position to share in the benefits of the work that is being carried on.

RECONSTRUCTION MEASURES IN GREAT BRITAIN

Ministry of Reconstruction

The far-seeing statesmen of England early perceived the necessity for thorough after-the-war planning. To that end, under the ministry of reconstruction, eighty-seven committees were appointed over two years ago to investigate and report upon after-the-war problems, with appropriate recommendations; in other words, to suggest the most practical means of safeguarding and promoting the welfare of the nation.

The duties and scope of each committee were definitely outlined. These eighty-seven committees were grouped into fifteen divisions, covering the whole economic field of reconstruction. The leading position was given to trade development. All of these committees have doubtless made their reports, and in some cases appropriate governmental action has already been taken.

Against State Control

There is voiced by the Committee on Commercial and Industrial Policy an acknowledgment and

approval of the widespread demand that measures of government control should be removed as fast as possible, and a basis of individual competition again established not only at home, but in foreign markets also.

Other recommendations which are of interest to the United States, because we are confronted with the same problems, are:

1. Fostering of key industries, such as dyestuffs, for instance, at any expense either by loans, subsidy tariff or government contracts.
2. Anti-dumping laws.
3. No special commercial treaties with Allies or neutrals in order to secure reciprocal concessions.

Conclusion

In general England is rapidly learning the lesson of cooperation without paternalism that leaves open the stimulant of individual competition. Her efforts are directed especially to the promotion of trade with and between the dominions overseas. She is specializing and organizing to bring the foreign buyer and the domestic manufacturer together. She has sent trade emissaries to build up trade good-will abroad in every country of importance, and while discriminating, perhaps, insofar as imperial trade arrangements are concerned, is thoroughly organizing to go after trade without pursuing any policy of unfair advantage. Essential to her in ordinary times, the securing of a large share of the world's trade is now nothing short of vital to her in the strenuous task of restoring the economic ravages of war.

POST-WAR PREPARATION IN SPAIN

A committee of the Spanish civil engineers has requested the Spanish Government to make an appropriation for a technical engineering exposition in order to prepare Spanish engineers to compete efficiently with post-war conditions. As a consequence the Spanish Institute of Civil Engineers has now been accorded the right to convene a Spanish congress of civil engineers in Madrid in the spring of 1919. In a circular issued by the institute it is stated that the object of the congress will be the organization of Spanish civil engineers for their mutual benefit and the development of their resources to enable them to compete efficaciously in large enterprises that will be undertaken after the war. A study will be made of Spanish production in its relation to other countries, and the growing exigencies of domestic consumption, so that if in the future another crisis like that of the present should arise, the country will be in a position to provide for itself. The congress will devote its attention to 12 sections, as follows:

1. Public works and transportation.
2. Naval construction.
3. Mechanics, motors, and machinery.
4. Mines and metallurgy.
5. Physical and chemical industries.
6. Electrotechnics.
7. Agricultural industries and their derivatives.
8. Forest industries and their derivatives.
9. Application of domestic industries to the needs of the war.
10. Elementary and superior technical instruction.
11. Organization of labor, of hygiene, and of social questions.
12. Industrial economy and legislation.

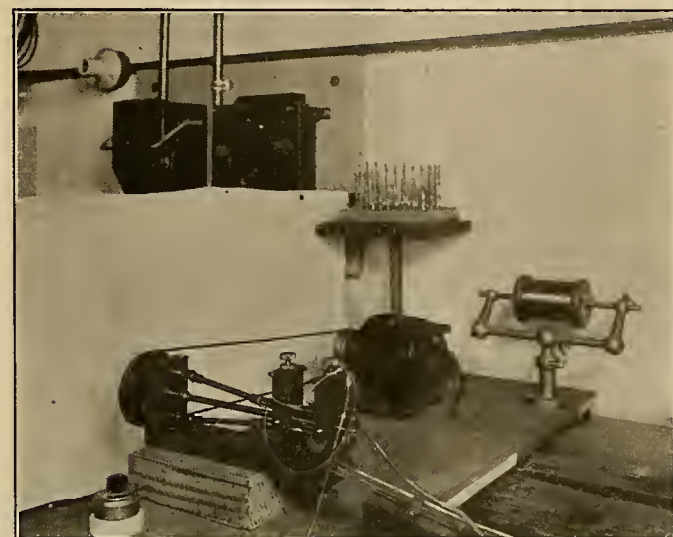
THE DEVELOPMENT OF THE VACUUM VALVE

(The vacuum valve not only is the factor which has made possible the wireless telephone used on aeroplanes, of which so much has recently been said, but it is also associated with many other modern developments in wireless telephony and telegraphy. A San Francisco man, O. B. Moorhead, is inventor of this remarkable device and its manufacture is carried on in the San Francisco factory here described, under the supervision of Captain R. W. A. Brewer of the British army, who has taken an important part in its development.—The Editor.)

The Importance of the Valve —

The device which is the subject of this article is very little known outside the sphere of those who are intimately associated with the modern developments of wireless telegraphy and telephony. The valve, however, has achieved such remarkable performances in the last few years, that it may be considered to be one of the most important devices in the wireless world and it has undoubtedly been an important factor in perfecting the means of sig-

naling in the European armies and navies. The type of valve in general use performs many functions, acting as a detector, oscillator, rectifier, amplifier or transmitter as the case may be, according to how it is connected up in the electrical circuit.



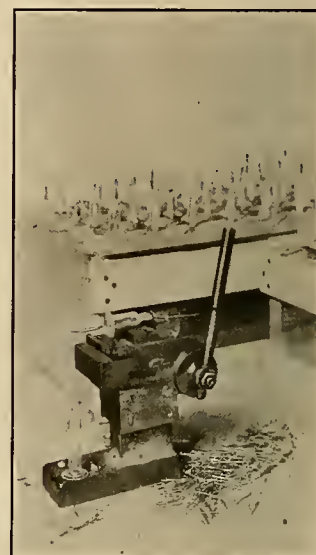
Three-spindle rolling mill for forming grids

naling in the European armies and navies. The type of valve in general use performs many functions, acting as a detector, oscillator, rectifier, amplifier or transmitter as the case may be, according to how it is connected up in the electrical circuit.

A valve is so termed because it acts as a rectifier for alternating waves, and it takes the place of the crystal when employed for this purpose, and for the following reason: The three element valve emits electrons from the heated filament to the anode and allows current to pass only in one direction from the anode, on which a positive charge is impressed, to the heated cathode.

It will thus be seen that only the positive portions of the alternating wave which is connected with the anode can pass to the cathode. Between the anode and the cathode a third element termed the grid is interposed, having a single terminal to which is connected one terminal of the outside circuit which is to be amplified or detected. This may be coupled up through the medium of a loose coupled coil and a condenser so that the radio waves impress varying potentials upon the grid. When the valve acts as an amplifier the plate current passing from the anode to the cathode is intercepted by the grid and influenced by the varying potential thereon and

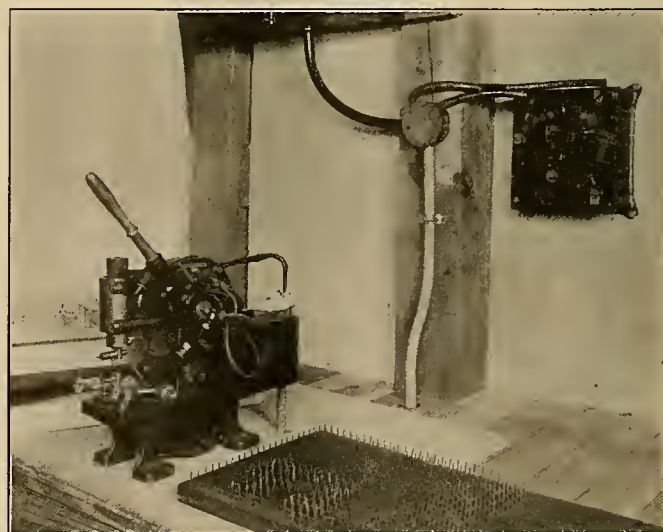
the slight variations in grid potential react on the plate current which latter is connected through the telephone receiver producing audible signals.



In Wireless Telephony —

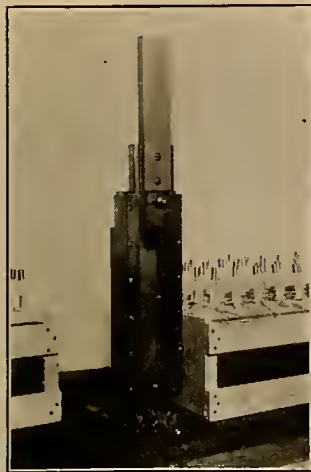
In wireless telephony one of these valves can be used as an oscillator producing a wave of radio frequency which acts as the medium for carrying the wave of audio frequency set up in another valve by means of a microphone transmitter, and at the receiving station the message is amplified by means of one or more valves in series according to the strength of the incoming signal.

Amplifying can be carried out to any desired degree, giving results which are perfectly true reproductions and free from those objections inherent



A spot welder for fixing grids—shown with grid in position—which gives a delicate location for welds. The plate welding machine has a different set of tools and mandrels but is otherwise similar.

with the use of metallic devices and conductors. Signals have been picked up in the war zone by means of wire loops laid on the surface of the ground and have been transmitted over long distances by radio phone and to and from aeroplanes in flight, the



Drop-hammer with trigger shown ready for action and element in position at base of machine. This forms a flat spring on the filament support wire for taking up the expansion of the tungsten filament.

whole apparatus being contained in a box not much larger than an ordinary cigar box. In aero work the generator is driven by a small propeller situated in the slip stream of the aeroplane propeller. The apparatus is fitted in the tail of the aeroplane and the aviator connects up his head receiver and transmitter by two plugs.

As Used in the War —

The British Service has used these Radiophone Sets for more than two years past, and the vacuum valves in connection therewith have been worked out

Double headed riveter for fixing and determining length of filament. This filament must be very accurate in respect to its electrical resistance and the exact determination of length is therefore a matter of considerable importance.



to a degree of nicety by the radio engineers in England. They are, however, based on the invention of Mr. O. B. Moorhead of San Francisco, who holds an American patent for the cylindrical anode. These valves are known as the French valve and this is probably due to the fact that Mr. Moorhead sent some of his valves to France some time ago. Previous valves were of various types but generally with flat plate anodes, flat grids and W shaped filaments. The Moorhead valve, in addition to having the cylindrical anode, has a spiral grid and a central filament, making a completely concentric arrangement so that

the distance between each of the elements is the same in all directions.

Earlier types of valves had a gaseous medium in the tube or bulb but in the modern devices great care and ingenuity are displayed in eliminating all traces of gases from the inside of the valve and a most severe test is imposed to insure that there shall be no blue glow when a high voltage is impressed on the anode and a specified dissipation is taking place inside the valve.



General view of glass machinery. The evacuating ovens are in the background.

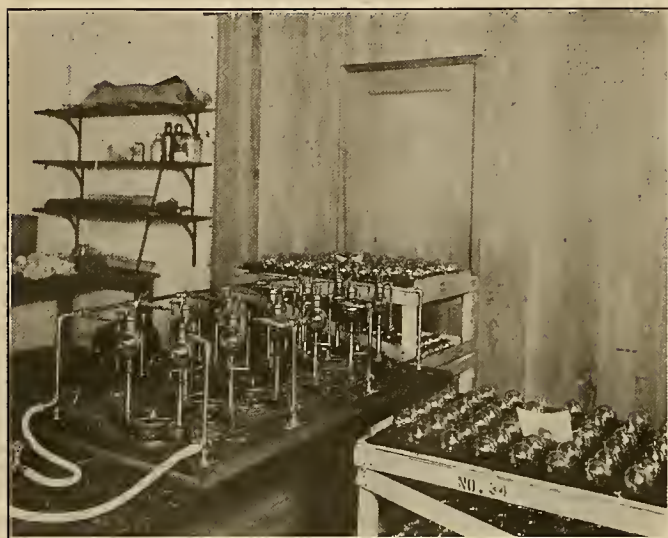
Mechanically Constructed —

Not the least interesting feature of the Moorhead Valve is the mechanical construction thereof, it being the only valve which is not truly hand-made. The methods which have been adopted in the works in San Francisco have been necessitated by reason of the lack of skilled labor in this art and in order to obtain the production aimed at in the time limits. All the machines and devices which are used have been constructed or adapted in the Moorhead Laboratories by Mr. O. B. Moorhead and his staff who have worked day and night in bringing these appliances up to their present state of perfection. The operators also, with very few exceptions, have been taught their various duties so that valves are being produced which are absolutely uniform and mechanically sound. The staff of inspectors test every valve electrically and periodical records of a comprehensive nature are taken to insure that the product is maintained up to the standard of requirements.

Manufacturing Details —

The upper floor of the factory is principally concerned with glass work; the bulbs in the rough must first have their stems shortened to the required length and be tubulated for pumping. The tubulating is performed in a machine having two heads, one of which fuses the glass where the pip is formed, this being blown out by a small internal air pressure. In the meantime the tube is heated under another gas flame and the bulb is transferred to the carrier holding the tube and the two parts fused together. It is then taken to a head having a ring of flames which play upon the stem, the surplus metal falls

by gravity and the end of the stem is blown out and broken off, thus leaving a bell mouth for the operation of sealing in the elements. Two machines are employed for sealing the element support wires into their stems, each machine having four heads, and two more machines each with four heads seal the completed elements into the bulbs. After each sealing-in process the glass members are immediately placed in rotary annealers to eliminate cracking. After inspection the valves then pass to the pumps



Six double-headed basing machine, for cementing brass collars after evacuation has been accomplished

for evacuation. In the Moorhead Laboratory ten ovens are employed for pumping, each one being fitted with a Langmuir mercury vapor pump, each holding fifty valves at once.

The evacuation of these valves has been one of the principal difficulties that manufacturers have had to face, as the degree of vacuum requisite to insure a reasonable length of life is far in excess of anything that has previously been manufactured commercially. The reduction in the length of time which can be devoted to the pumping process is also an important factor in a commercial undertaking. This has been achieved in the Moorhead System of evacuation, and the rate of pumping exceeds a thousand valves a day at the present time, with only about half the ovens in operation.

Some of the machines which have been produced in order to insure uniformity and accuracy in the manufacture of the elements deserve particular attention, by reason not only of their ingenuity but also of the novelty of purpose for which they are employed.

The tungsten filament, which is of exceedingly fine diameter, must be very accurate in respect to its electrical resistance, and it also has to withstand a considerable degree of overload in testing. The tungsten wire is first crimped in a motor driven rolling mill, long lengths of wire being treated at one time. After the supporting wires have been sealed into their glass stem they are cut off to exact length in a combined machine; the first operation of the lever shears off the surplus metal, the stem is then placed in another position and a small hook is formed in the short wire which supports the

lower end of the filament. The end of the hook forms the locating point for future operations.

The grid consists of a spiral coil which is wound in two-foot lengths from a spool of nickel wire. Each



One of the electrical testing outfits used by government inspectors, showing high reading and low reading voltmeters. Also the milliammeter for plate current, which has to show a voltage tolerance of not exceeding 2 milliamp. The microammeter has to show a positive tolerance of 0.5 micro-amp. The filament ammeter must indicate a tolerance of 0.035 amp. positive or negative.

grid is cut off to exact length and is welded to its supporting wire in exact place by an electric spot welder. The anode cylinders are first stamped out from nickel strips and rolled into form in a specially constructed mill having three power driven rollers; they are then welded onto the supporting angle piece by an electric spot welder.

This system of spot welding has required a great deal of care in attaining its present state of perfection, as the work has to be done most accurately and the shapes and sizes of the material worked upon are very awkward.

After these elements have been centralized, the top supporting wire for the filament is placed under a drop hammer which flattens it at the bend and gives it the necessary amount of spring to take up the expansion of the tungsten filament when heated.

The system of fixing the filament to the supporting wires, though simple, is very ingenious, it being riveted in place in a machine with two heads which gauges off the exact length of filament every time. The surplus metal is cut away by hand.

After various intermediate operations the valve bases are cemented in place on a machine which is motor driven and having six double heads. In the first carrier the valve is brought opposite a gas jet which dries out the cement while the valve itself rotates, and upon touching a trigger the head rotates through half a revolution and the valve is brought opposite to an air stream which cools it down.

The remarkable uniformity of the product is evidence of the perfection of this system of manufacture.

"YOU MUST DISPLAY GOODS TO SELL THEM"

There is nothing more true than that attractive and conveniently arranged stores get the cream of the business. According to the Hardware World, it doesn't make any difference whether you are catering to the trade of men or women. People are influenced, unconsciously though it may be, by a neat, attractive store. A large part of sales are made by suggestion. People forget they need certain goods until they are reminded of them by display.

DISPOSITION OF OVERSTOCK

BY A. L. SPRING

(The taking of inventory at the beginning of the new year discloses always certain lines of stock of which the dealer has an over-supply. The question of what to do with this material in order to free the inactive capital is taken up by the representative of the California Electrical Cooperative Campaign in the southern part of the state, who suggests several ways of moving overstock.—The Editor.)

An Inventory Problem —

The disposition of overstock is a problem which confronts every merchant and with the electrical dealer it is a problem not easy of solution. At this time of the year when inventories are being taken, overstock is brought forcefully to our attention. Electrical dealers as a whole have not given this subject anywhere near the thought and attention which it rightfully deserves and which for the greatest success of the business it must have.

Overstock should, if possible, be disposed of at regular prices, but it is much more profitable at times to sell it at greatly reduced prices and even occasionally below cost than it is to carry it year after year, each succeeding year usually decreasing the chance of sale at any price.

Special Prices If Necessary —

Every merchant in every line of business makes special prices on overstock items and if in the electrical business they cannot be disposed of at the regular prices, special prices should be made and should be low enough so that the articles will move. In extreme cases, it is profitable to junk certain items instead of carrying them in stock for several years. It costs money to carry any article in stock and this should be taken into consideration at all times when overstock is studied. Now, while junk values are high, is the time to clean out and convert into cash some of that overstock which there is little chance of selling.

In my work as representative of the California Electrical Cooperative Campaign, I have seen a number of methods used by the electrical dealers in California in disposing of overstock. It might be well to consider some of these for a few moments as there might be a suggestion or two worth following.

Cooperation a Solution —

What is overstock for one dealer may not be overstock for another and also, by dividing a dealer's overstock among several dealers it probably would not be overstock for any of them and might in a reasonably short time be turned into money. There is certainly an excellent opportunity for valuable cooperation among dealers in the disposition of overstock, and the first thought a dealer should have in reference to the sale of overstock should be to sell it through cooperation with his competitors. If each dealer will help the other dispose of overstock much will be done toward solving the overstock problem.

Attracting the Attention of Customers —

One of the means frequently used by dealers to dispose of their overstock is to have in their store an overstock or bargain table on which is displayed various overstock and the table is plainly marked

"OVERSTOCK TABLE" or "BARGAIN TABLE."

Usually the prices of all the articles are shown in plain figures. There is a certain class of persons who are always looking for bargains and to them this kind of selling appeals and sales result. Also, with these goods in sight customers sometimes see articles that are just what they have wanted but which they would not have thought to purchase but for the policy which acted as a reminder.

One of the leading dealers uses another means of accomplishing the same results. This scheme is probably as effective as the other and at the same time is higher class merchandising. This dealer has purchased attractive oak boxes, the same as those used on desks for in-and-out mail and the smaller articles are neatly displayed in them and they are placed on a table in a good location in the store. The prices on all the articles are shown on price tags held up from the box by a wire frame. There is no suggestion that the items shown are overstock or are bargains. The prices tell the story and the results prove the plan to be effective. The scheme was instituted a few months ago and has since sold many articles which have been in stock for years.

Using the Window Space —

Show windows can be used to excellent advantage in selling overstock. One dealer every few months gathers together all of the overstock items which he can sell at the same price and attractively displays them in his window with a large window card similar to the following:

"SPECIAL FOR THIS WEEK"

"ANY ARTICLE IN THIS WINDOW FOR \$5.00"

Another dealer uses his show windows to turn overstock into dollars by displaying articles of various prices and sizes, with a price card for each article on which is shown the regular price in black, with a line drawn through it, and the special price shown in red. This window is also sometimes used as a "Special for This Week."

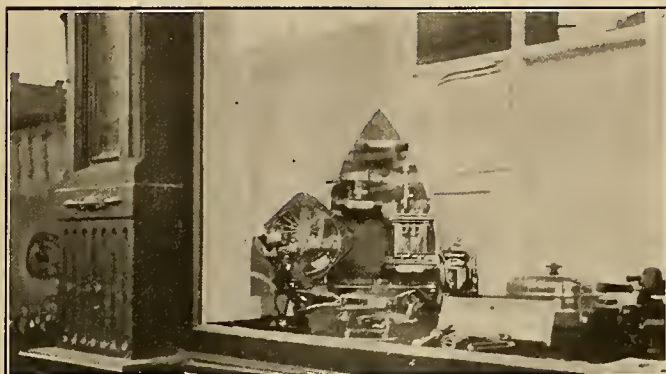
The Bonus Plan —

One of the best means of reducing overstock seldom used by electrical merchants, but which is frequently used by merchants in other lines, is paying a commission or bonus to the salesmen on all overstock articles sold. If this scheme is properly handled it will undoubtedly accomplish results and will not in any way antagonize the customers.

Generally speaking, nearly every method used to stimulate the sale of regular stock can be used to force the sale of overstock. Newspaper advertising, circular letters and effective use of manufacturers' advertising literature can and should be used to advantage.

Western Ideas

A LARGE ELECTRIC IRON is effectively used as a background in this attractive window by C. M. Lockwood of the electrical company of that name in Salem, Oregon. Hotpoint ware is featured, the material for the window trim being simply selected from that in stock plus the advertising matter from the manufacturer. The feature which attracted most



An iron as a display stand

attention was that of the large iron base which served as a standard to hold other ware. The window as a whole was well conceived and neatly carried out, and the feature of novelty which the mammoth iron introduced served as a distinctive item and helped to fix the display in the mind of the passerby.

LAMPS CRACKED BY MOISTURE often result in trouble for their user and in consequence to the store which sells them. Credit is frequently asked by customers for lamps claimed defective due to water cracks—a state of affairs which might be avoided if due precautions were observed. The following suggestions, offered by the Edison Sales Builder, will prove useful:

A high wattage lamp in a relatively small enclosing fixture requires proper provision for dissipating heat which can be done either by proper ventilation or sufficient radiation surface, or both.

To provide effective ventilation, the fixture should have openings of ample size so arranged as to give a chimney effect and thus induce a continuous draft through the fixture. Improper or restricted ventilation may be actually detrimental by drawing heated air to the parts of the lamp which should be kept cool.

Ventilation openings which allow moisture to collect on the lamp do more harm than good on account of the liability of this moisture cracking the bulb, so that outdoor fixtures should be weather-proof.

Ordinary enclosing fixtures, such as used for indoor lighting and small lightweight outdoor fixtures, when used with Mazda C lamps, especially of high wattage, require ventilation openings, otherwise the lamp would become too hot to give satisfactory life results.

Heavy outdoor fixtures usually have sufficient radiating surface so that ventilation is not essential,

and if troubles from water cracks have been experienced it is suggested that the ventilating holes be plugged up to make the fixture more weatherproof.

Vapor-proof fixtures having small tight enclosing globes have practically no ventilation and relatively small radiating surface. While their use is justified under the extreme conditions for which they are intended, a sacrifice in lamp life may be expected.

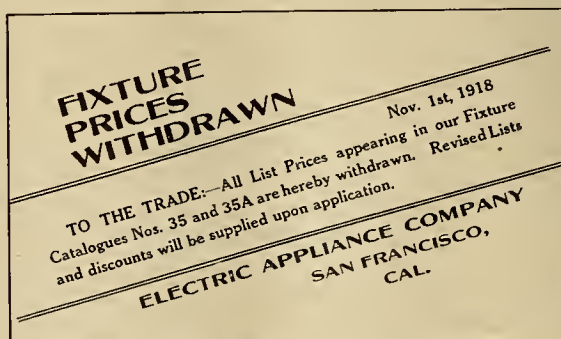
AN INTERESTING BUSINESS CARD is that of W. I. Otis, Pacific Coast representative of the Square D Company. The first impression is that of an ordinary business card of slightly unusual shape. On turning the card over, however, a neat representation of a Square D enclosed switch box appears.



The card as spread out—only the middle section shows on first inspection. Below is the switch box cover which appears on the back of the card and above the interior of the box disclosed when the cover is folded back. Within is advertising matter on the subject of the switch itself.

The cover of the box proves to open, being secured by a flap inserted in a slit along the side of the box. The inside of this cover is also true to shape and below is shown the interior of the box with the switch in color and all details. Within the little folder is a description of the switch and some of its talking points and a list of some of the firms who have found it satisfactory.

A SIMPLE WAY OF ATTRACTING ATTENTION by tilting the reading matter makes this little notice of a change in prices effective. The slip of



A notice which will be noticed

paper was itself of a giddy yellow—but it is obvious to the casual observer that the same notice printed horizontally across the page would appear tame by way of contrast. It is another instance of the value of the unusual.

CUTTING TIME ON INSTALLATION WORK

(A systematic planning of electrical installation work as it is carried out in a big ship yard which holds a suggestion for the electrical contractor. A plan of procedure, a treatment of green hands and a method of getting the best from the foreman which will recommend itself to other types of work as well.—The Editor.)

Against the background of figures gathered on installation of electrical equipment during the building of ships in the Ecorse plant of the Great Lakes Engineering Works previous to 1915, some other figures gathered since, as reported by the Emergency Fleet News, stand out rather boldly. Today if more than 1,100 hours are spent in the electrical installation for one of the 3500-ton freighters now

the average daily quota now is a fraction under three. Nor is there such a thing as overtime.

Under conditions at Ecorse the man of average intelligence will show enough ability after three months as a helper to merit a raise in station to that of handy-man and raise in pay as well. In six months more he will have become proficient enough to be a wire man. From then on his advance depends very much on himself. Bundesman has found that it usually takes six months for a wire-man to develop into a second-class electrician and six months more to become a first-class electrician, providing the man in question has applied himself to his work faithfully and intelligently.

Green Men on Unskilled Work

Only green men cut and thread pipes, wind coils, and do the other work that requires no particular skill. If he is a heavy man, weighing 180 pounds or more, he gets such a job as cutting and threading 1½-inch and 2-inch pipe. If he is a small man and not used to heavy work he gets the job of preparing ¾-inch and 1-inch stock. Only light men are used in pilot house work. It has been found by actual figures that better results can be obtained by their use there. A lightweight can do this work easily.

Intelligent distribution of green and trained men over one job—the building of a main line switchboard, for instance—will show some astounding results. Formerly this job was turned over to one or two trained men who saw the job through to the finish. Now a gang of mixed capabilities does it. Here is the time sheet for one of the main line switchboards recently built at Ecorse:

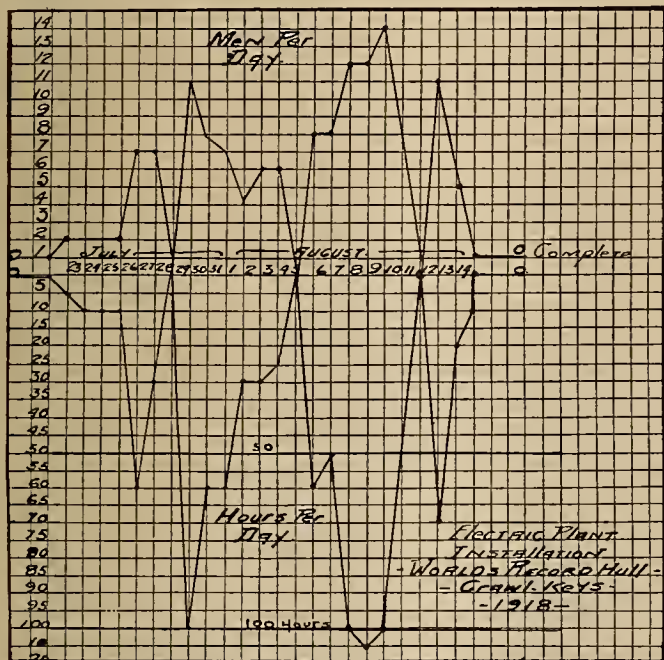
2½ hrs.	@	\$0.72	.....	\$1.80
10 hrs.	@	.52	.....	5.20
15½ hrs.	@	.46	.....	7.13
5 hrs.	@	.52½	.....	2.62½
1½ hrs.	@	.70	.....	1.05
				\$17.80½

The labor item on this job formerly was \$50 and upwards. The 72-cent and 70-cent-an-hour men lay out the work on the slab. That is their only contribution. The rest of the work is done by men earning 46 cents an hour and up. The rule that high paid men are to supervise and low paid men to construct is followed out religiously.

With the labor item reduced to that low figure the cost of unpacking the slab and removing it from the store room and back again, \$3.30, looms up rather large, proportionally.

Gives Men Splendid Training

In the 21 months during which Bundesman plans to make a first-class ship electrician out of a fairly intelligent and willing helper, he gives his men a splendid training course. The work is so arranged after the initial ship of the one order has been laid out that the work for all the order can be done without interruption, and without going through those



A chart which shows the record of accomplishment in electrical installation under a systematized scheme of work

under construction, something is wrong. Foreman Charles Bundesman knows there is, because his tables call for the work to be done in approximately 1,000 hours. Four years ago such an installation required, as a minimum, 4,500 hours.

The custom prevailing in many shipyards whereby individual measurements for each ship of one order are taken, has been discarded by Bundesman. Instead, he treats the whole order, whether it be five or fifty ships, as one vessel. Instead of one man measuring up one ship, and another, another, the best men in the department do the one job together.

With their figures as a working basis the whole ship is laid out from an electrical standpoint and blue prints drawn up. The measurements for the conduit and pipe runs in the pilot house, for instance, will be uniform on all ships of that order. Two men aren't going to have the chance to dispute as to whether a steel tape or a drug store ruler is the authority.

Fewer Men Used

The manpower aspect of this system is interesting because, where 15 to 25 men was the average quota for a ship of the same size three years ago,

The Uniform Proposal Blank is simplified to the last degree and is easily understood by the customer. The unique feature is the fact that this blank becomes a formal contract between the customer and the contractor without any other necessity than the customer's signature.

ELECTRICITY IN THE SCHOOLS

BY W. R. PUTNAM

(The use of electricity in the schools leads to the more extended use of electricity in the house. Not only is the next generation educated in the electrical idea, but they carry the convenience of it home and help to make their parents prospective customers. The possibilities for electrical cooking installations and electricity in shop work are here taken up by the head of the sales department of the Utah Power and Light Company.—The Editor.)

In our electrical education of the child we have too often neglected the opportunities afforded by the schools.

The cooking classes in the school give us opportunity to train electrically the future housewives. A modern and well equipped domestic science kitchen should contain an individual electric hotplate for each pupil and sufficient ovens so that each small group has an oven.

The first domestic science installations in schools were of portable hotplates attached to the feed wires by a flexible cord. This proved satisfactory except there was always the complaint of tipping food over and falling utensils from the elevated cooking surface.

With the assistance of the Diato Products Company, there was developed the idea of using the enclosed heating unit and making the cooking surface flush with the table top. To do this it was necessary to produce a non-combustible, heat insulating, fire-proof, waterproof and smooth table top. Diato Products Company submitted samples of their diamaticious earth and showed that it would answer all of the requirements set forth.

This material has recently been put on the local market, but has been used extensively in Germany under the name of Kieselguhr. It is mined as a white soft rock and then pulverized to a fine powder of about the same fineness as flour. Great care is necessary in pulverizing the rock so as not to crush or squeeze the material and thus destroy the minute air cells which give it the high heat insulating value. After it has been milled to the desired size, the secret process used by the Diato Products Company is applied. This consists of the addition of certain chemicals to the powder until it reaches a consistency equal to that of mortar. It gives the finished product a tough, elastic and hard surface.

In the soft condition it is spread on the table top to the desired thickness and made into particular form desired. Any color desired can also be secured by the addition of pigment to the mud.

In the domestic science department using electric range enclosed units, a hole is cut in the table large enough to accommodate the connection plug and box. A sheet metal ring of almost the diameter of the hotplate is then placed around the hole with its top edge high enough to hold the rim of the hotplate flush with the table surface. The mud is then poured on the table and moulded as desired. This ring answers a two-fold purpose: it facilitates renewal of hotplates and prevents the mud from hardening around the plate and frequently damaging the top when the plate is removed.

After the mud has hardened for about twenty-

four hours, the top is worked down to a smoothness almost similar to a hardwood table top and oil is worked into the surface to give it a gloss, make it waterproof and prevent checking. A second application of oil is applied about twenty-four hours later and the work is then completed.

The plate is then connected by a flexible cord and set on the metal ring and the equipment is then ready for use.

In case a cafeteria is run in connection with the school, electrically heated soup kettles, large bake ovens and electric ranges are desirable equipment and assist in helping the propaganda of electric cooking.

As a rule, the domestic science teacher affords the greatest assistance in securing an electrical installation in the schools. Oftentimes where the necessary funds are not available for an expensive and durable installation, a start can be made by installing grill stoves and similar equipment, which can later, without great loss, be exchanged for the standard equipment.

The increasing number of manual training installations provides the opportunity to educate the boys to the advantage of electric power. The central station should supervise the planning of the installation to insure a proper equipment so that the boy users cannot help but realize the convenience of this type of power, both in connection with wood and metal work.

As a rule, the above electric installations lead to the conversion of the steam-drive of the ventilating system in the school buildings to electric drive, with the result that an additional desirable load is obtained.

DATA ON WOMEN'S WORK WANTED

The Woman in Industry Service of the United States Department of Labor is collecting and distributing information on such topics as the extent of employment of women during the war, the wide variety of their employment, the methods by which they have been successfully introduced into new occupations, and the safeguards with which it has been necessary to surround them in the interests of their health and efficiency.

Plans are being made to establish a pictorial record of the work women are doing, and the Woman in Industry Service is asking for the cooperation of the employers of the country in assembling these pictures. Illustrations are designed of the various processes on which women are working, particularly those in which women are substituting for men; mechanical adjustments installed to enable women to do work formerly impossible for them; safety devices that have been found necessary to protect women workers, and special arrangements and equipment that have been installed for the comfort of the workers. When the photographs are forwarded it will be appreciated if a statement is attached of the name of the process and any other particularly significant facts. If the pictures are published the names of the firms from which they were received will not be used without permission.

WESTERN SECTIONS OF NATIONAL SOCIETIES

BY ROBERT SIBLEY

(A paper which was presented at the recent annual meeting of the A. S. M. E. in New York by the editor of the Journal of Electricity, who was joint delegate from the San Francisco Section to both the annual convention of A. S. M. E. and the Section's conference of the Society held in New York. The subject is one of such general interest in the West, with a bearing on the movement for united engineering effort, that the paper is here reproduced in full.—The Editor.)

When it is realized that the great and influential engineering organization known as the American Society of Mechanical Engineers has but two organized sections west of the Rocky Mountains, and when some conception of the vastness of this area coupled with the present wonderful possibilities for engineering development is brought to your attention, members of the Society can then formulate some conclusions as to the present difficult problem which confronts the Far Western Sections and which limits

With an idea of vastness of the country involved and the magnitude of engineering effort called forth, with problems new to engineering design, members of the Society can readily appreciate how our two sections in the Far West, situated over 3000 miles from the Society headquarters, find contact with the Society as a whole extremely difficult. It is not surprising that we often find our arguments to induce our fellow-engineers to join the Society of little avail. For under such circumstances, since few of our men rarely visit New York City, and since the large number of questions discussed through the Journal of the Society are wholly foreign to problems that vex us for solution, it is difficult for local engineers, not members of our Society, to see wherein a fair return is to be received for the annual dues of fifteen dollars required for membership.

The Local Section Idea —

So those of us in the Far West who have this matter at heart see, in the fuller development of the local section idea, the only ultimate hope for profitable helpfulness both to the members and to the Society as a whole in its work for the betterment of the engineering profession,—not alone in New York City but in the far nooks and corners of this broad country of ours. With this ideal in view it would seem that for the ultimate development of Society effort west of the Rockies there should be established as reasonably soon as circumstances will permit, duly organized sections in the sea port centers such as Seattle, Portland, San Francisco, Los Angeles and inland centers such as Spokane, Butte and Salt Lake City. Such sections, if harmoniously organized in relationship to sections of other national engineering societies agreeable to some such scheme of organization as now prevails in San Francisco, will unquestionably reflect wonderfully the spirit of helpfulness of this great parent society, and contribute to a marked degree in recruiting new members, for mechanical engineers in the section west of the Rockies available even now in large numbers, will then see the possibilities for good in associating with such local organizations in their immediate field of activity, engaged in discussing the very problems with which they find themselves engaged in daily practice. Hence such a development of section activity in the Far West would contribute four vital factors in furthering engineering society activity:

1. It would interest local members as nothing else can.
2. It would make possible enlarged membership—a source of increased revenue for the future that would far repay the money invested.
3. It would make the Far West more accessible for Eastern members who are now either coming to these districts of the West in ever increasing num-



ONLY TWO A. S. M. E. SECTIONS IN THIS REGION

A picture which shows the vast extent of the Western region and the importance of its enterprises in contrast to rather limited membership in the great engineering societies. If the northern border of California were in New York City, this measuring stick of power lines down through California would traverse south across New Jersey, thence across Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and finally wind up somewhere near Jacksonville, Florida.

the helpfulness that could otherwise be rendered to this growing district by the Society, and, too, prevents the growth and expansion in membership in this region which is even now possible to a far greater degree than our present membership totals would indicate.

bers, or are en route to Oriental ports where new activities are engaging our membership.

4. And above all, it would immeasurably build up a larger and more useful American Society of Mechanical Engineers—at least so far as our district of the nation is concerned.

Joint Society Activity —

To make this section life of fullest usefulness a close spirit of cooperative helpfulness is necessary in each center with local engineers and with members of other local engineering societies in the district. The San Francisco section, through the very able efforts of its Chairman, Mr. E. C. Jones, himself one of our most distinguished engineers, who has done such wonderful work in the development of the oil gas industry, and who has devoted this same genius and tireless effort in developing our section program and activity for the year, has entered into a local joint arrangement with four other local sections of national engineering societies, which it is believed is practically ideal.

Briefly, this arrangement is as follows: The San Francisco Engineers' Club, which now has a monthly income from dues, not counting income from luncheons, of almost \$1,000, has generously offered our section a table each week, when we have a section luncheon, at the same price it is offered to its own members. These weekly gatherings have proved very profitable and enjoyable. Once a month four of our members sit with four representatives each from the four other local sections of national engineering societies at what is known as the Joint Council. Prof. C. D. Marx, now acting president of Stanford University and who is a past president of the American Society of Civil Engineers, is president of this council, while our energetic section chairman, Mr. E. C. Jones, is vice-president. The function of this Joint Council is the furtherance of the common interests of the members of the engineering profession in the district and rendering of public service as opportunities arise.

Some concrete examples of the good that has already been accomplished by this Joint Council are as follows:

1. Definite dates have been fixed for the holding of individual section meetings to avoid conflicts in meeting nights.
2. The bringing about of a saving in labor and expense in secretarial work by joint use of addressograph and many economies in clerical help.
3. The joint offering of engineering talent for war service and for historical data now being called for by the War Department.
4. Joint action on very necessary legislative matters is being brought about, such for instance, as urging the appointment of an engineer member of the California Railroad Commission, an engineer member of the Board of Regents of the State University and legislation affecting the legal status of engineers in the commonwealth of California.
5. The establishing of an effective Service Bureau in which active effort is made to secure accurate information on vacancies open in engineering activities and the placing of capable applicants in employment.
6. The holding of two to three joint meetings of all national engineering societies annually, covering discussions of such broad interest that participation by the engineering profession as a whole would prove helpful; such, for instance, as fuel conservation, water power development and the like.

The Section and Its Activity —

And this splendid spirit of cooperative helpfulness which is made possible by the Joint Council, has

assisted us in San Francisco in developing a section life that is almost ideal. Our section has held under its auspices the first combined meeting of all the local sections. The subject of the evening was Fuel Conservation, and eleven noted engineers and public officials, by presentation of papers, participated at the gathering. The attendance was perhaps the most representative ever held in San Francisco, excepting of course the gathering during the Exposition year of 1915. There were 325 engineers in attendance and the papers and discussions of this meeting have been widely quoted throughout the West. Meetings in which the section alone will participate are already scheduled for the year and every promise is apparent for their successful consummation. On December 16th a noon-day luncheon talk on pulverized fuel will be given by Mr. M. C. M. Hatch, of the Locomotive Pulverized Fuel Company of New York, at which meeting we expect to have at least one hundred engineers present. On December 19th our evening meeting will be devoted to the Diesel Engine and its use in ship propulsion. Three splendid papers are being prepared for the occasion and it is believed that the fuel oil situation in the West will be better clarified from the discussions. In January our section will have an evening given over to a smoker and a general get-acquainted meeting at the Engineers' Club room, and so on down through succeeding months, profitable social and technical meetings are in the making, and in addition to all this, we have each week our informal luncheons of our section at the club rooms.

The Question of Expense —

In the Far West we realize full well the trying stress, financially, under which the mother society labors to meet the vast outlay necessary to put through the progress of national helpfulness the Society has undertaken. It is the firm conviction, however, of your Far Western Sections, that more effort and financial assistance devoted to this growing district of our country would not be a matter of charity, but the actual money returns in an immediate influx of new members would not only strengthen the Society nationally but would create an increasing financial revenue in dues that would prove a permanent gain many times the outlay involved. In addition to this financial assistance we need more personal contact, we need the broadening assistance derivable alone from hearing men of eminence in our profession in these Western centers as well as men familiar to our localities, and we hope some means may be secured whereby the leaders when visiting our district may make themselves better known and advantage be taken of their helpful counsel.

In conclusion I would say that it is only by this mutual cooperative helpfulness that we can ever hope to raise the standard of the profession as a whole to its ultimate goal of usefulness, for only in such manner can the individual hope himself to prosper and can we ever hope to bring out that ultimate beautiful and high standard of individuality which is unquestionably the hope of all of us.

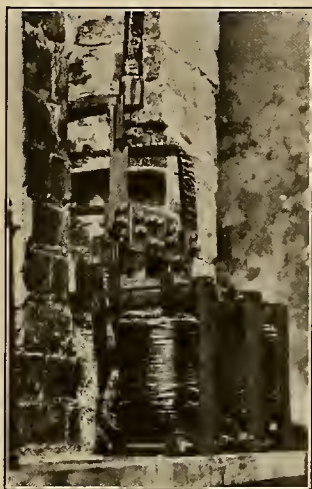
SAVING THE WASTE WITH AN ELECTRIC FURNACE

BY C. B. MERRICK

(The installation of an electric furnace which has more than met expectations. Not only does it admirably serve the purpose for testing out special grades of iron, but it adapts itself readily to the utilization of waste materials and is largely fed on scrap iron from the shops. The resultant product passes a very satisfactory test.—The Editor.)

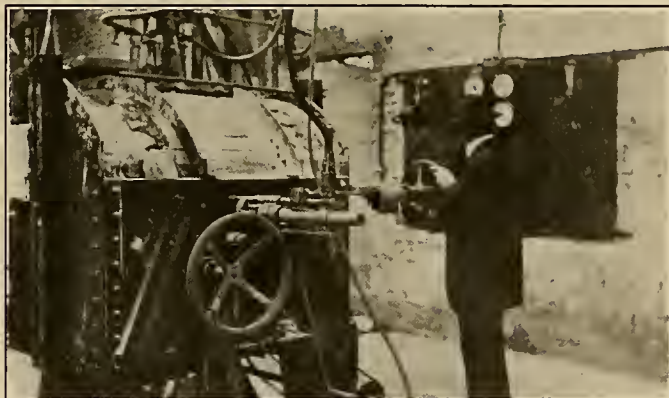
The electric furnace has become recognized as invaluable for special uses in connection with foundry work. As with all electrical appliances there

are features which recommend it in preference to the methods it has to a certain extent replaced. In accordance with the progressive policy of that company the Pacific Foundry Company, located at 18th and Harrison streets, San Francisco, has installed a furnace for experimental use with iron, to be used in conjunction with the cupola furnaces which had been previously entirely relied upon. The demand for special grades of cast



Reactance coil to prevent overload

iron, with particular qualities—such for instance as a resistance to acids, etc.—has been met to such an extent that the installation of the electric furnace for the distinct purpose of further investigation was considered justified. Consequently a two-phase Rennerfelt Furnace of 750-lb. capacity was put in



Adjusting the arc of the electric furnace

and is now utilizing small pieces of waste iron such as nails, borings, etc., which could not be successfully placed in the cupola furnace, the resultant saving amounting to a considerable item.

The furnace as installed is shown in the accompanying photographs, the three electrodes extending into the furnace from the top and both sides. The top one is the common electrode of the three-wire two-phase system of power supply, while the others are connected to the outside wires. In the first view the operator is shown adjusting one of the side electrodes by means of the hand wheel and gears which control the operation of feeding. The electrodes are made in sections, threaded so that the

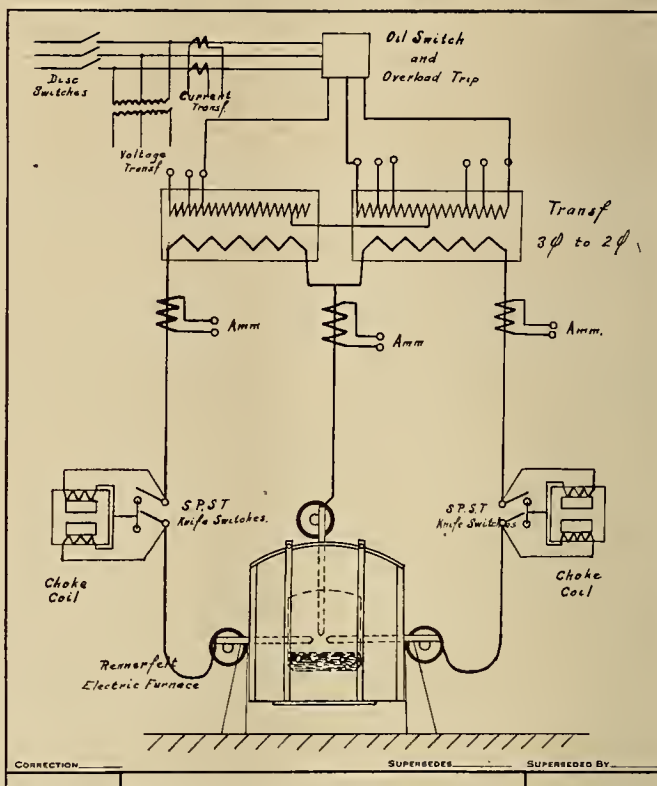
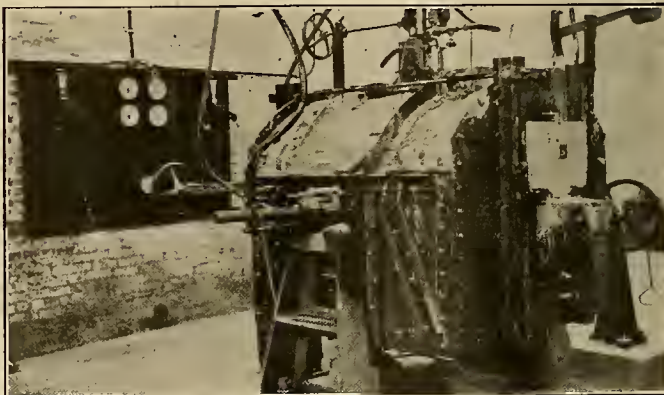


Diagram showing layout and connections of the electric furnace as in use at the Pacific Foundry Company's shops at 18th and Harrison streets, San Francisco.

the furnace, which pours through the gate at the end of the furnace, as shown in the second view. This also shows the hose connections at each elec-



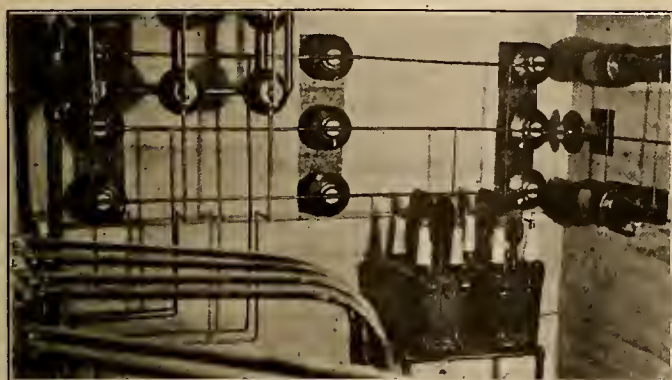
An electric furnace as installed by the Pacific Foundry Company which is used for experimental purposes, melting up scraps of waste iron and thus serving two purposes.

trode which supply water to the jackets used for cooling purposes.

Meters and reactance coils in each phase indicate exact operating conditions and prevent excessive overloads. Power is supplied by an 11,000 volt

tap from the system of the Pacific Gas and Electric Company.

The electric furnace has been largely used for



Switches and meter transformers

steel products, but this experiment has been exclusively used for iron to be cast. It produces an iron with a lesser percentage of carbon than that available in the cupola furnace, as some of the carbon is burned out in the electric furnace. This results in an iron with very desirable qualities. A typical iron has about 2.8 per cent carbon, $\frac{1}{2}$ per cent sulphur, silicon and manganese as desired, and no phosphorus, as this would tend to make the iron brittle when cold.

The possibilities of this method are well illustrated by tests which have been carried out at Columbia University on castings made direct from steel scrap in an electric furnace. The strength as shown by these tests ranged from 40,730 to 45,030 pounds per sq. in., or considerably higher than ordinary cast iron.

SOME REFERENCE BOOKS OF VALUE TO ENGINEERS

BY LOUISE B. KRAUSE

(Next to knowing a fact is to know where to find it, according to the old adage—and this is particularly true if you are building up a library within your own organization. The following group of essential reference books for public utility engineers has been selected by the author from years of experience as librarian of H. M. Byllesby & Company, Chicago.—The Editor.)

All engineers have need often to consult reference books for specific information in connection with their work, and it is the purpose of this article to bring to the attention of engineers of public utilities some sources of information of practical value to them in the prosecution of their work.

Directories

Information as to who, what and where are certain utilities is constantly asked. Every utility engineer should be acquainted therefore with the contents of **McGraw Central Station List**, published annually, price \$15, by McGraw-Hill Company, New York City, a list of central stations in the United States and Canada arranged by states and cities. Population of the town or city, controlling interest, names of officers, capitalization, list of power house equipment and extent of service of the various companies are given. Examine the volume for additional lists and note the index to central stations whose names do not indicate their location.

The N. E. L. A. Rate Book, published annually with quarterly supplements by the National Electric Light Association, New York City, price \$10, gives rates for electric light and power in cities of the United States and Canada having population of 25,000 and up.

McGraw Electric Railway List, published semi-annually—February and August—price \$7.50 a year, treats the electrical railway field in the same manner as the Central Station List does its field.

Brown's Directory of American Gas Companies, published annually by Progressive Age Publishing Company, New York City, price \$5.00, is a complete directory of all artificial and natural gas companies of the United States arranged by states and cities, giving data on population of city, controlling interest, names of officers, list of equipment, data on production and by-products, statistics of sales and

prices of gas. The volume also contains lists of oil producers and oil refiners with data on their operations. The contents page of this volume should be carefully examined in order not to overlook the valuable information contained in its supplemental lists.

The organization, personnel of management, earnings and financial histories of public utilities are recorded in **Poor's Manual of Public Utilities**, price \$7.50, published annually by Poor's Manual Company, New York City. The same information can be found also in **Moody's Manual of Public Utilities**. Both of these volumes contain excellent maps of important distribution systems.

Thomas' Register of American Manufacturers—first hands in all lines—is an indispensable directory. It is published annually by the Thomas Publishing Company, New York City, price \$15. The entries are in three main sections. The first section classifies the manufacturers according to their productions, in an alphabetical list; the second section lists the manufacturers alphabetically by their names; the third section lists all the popular trade names alphabetically.

Government Documents

The United States Government is one of the most important publishers of accurate information of interest to engineers, and no data should be compiled without taking into consideration the sources of government information on the subject. The following are a few of the most important publications of interest to engineers who are concerned with the construction and operation of public utilities.

All engineers concerned with the development of hydroelectric projects must know where to find accurate stream flow and rainfall records. The principal source of information on stream flow is the **United States Geological Survey**, in which gage heights, rating tables and discharges in second feet

are given of a large number of rivers classified under their respective water sheds.

The United States Geological Survey has also published in its water supply series, papers on the water resources and water powers of certain states and regions which supplement the papers recording the stream flow in various water sheds. There will also be found in the list of publications of the United States Geological Survey important papers dealing with irrigation, underground waters and flood conditions.

The Director of the United States Geological Survey, Washington, D. C., will send free of charge on request, a valuable catalogue of publications which lists all of these papers, many of which may be obtained free of charge. Water supply papers 119 and 340 contain alphabetical indexes of all names of rivers on which stream gaging stations have been maintained.

The **Topographical Map Sheets** published by the United States, showing the territory surveyed with the names of the topographic sheets for ordering, may be procured free from the Director of the Geological Survey. The map sheets sell for ten cents each, in lots of fifty or more, six cents each. The Superintendent of Documents, Washington, D. C., will supply free of charge a catalogue (price list 53) of all the maps issued by the different departments of the United States Government, giving description and cost.

No hydroelectric investigation can be adequately conducted without reference to the rainfall data of the region. The **Monthly Weather Review** and **Climatological Data**, both published monthly by the United States Weather Bureau, are the best sources of information for rainfall data and the engineer who has access to a library containing volumes covering complete records to date will be most fortunate.

A catalogue of the publications of the **United States Bureau of Standards** may be obtained free from the Bureau which lists most valuable publications; many of these can be obtained free of charge or at small cost and are of great value to electric and gas utilities. Some of the publications deal with the standards for electric and gas service, electrolysis, specifications for electric wires and cables, electrical safety codes and other similar information.

The catalogue of the publications of the **United States Census Bureau**, free also for the asking, gives a list of valuable statistical publications dealing with central stations, electrical railways and telephones in the United States.

The **United States Bureau of Mines** will furnish a list of publications on tests of fuels, boiler and furnace efficiencies and other information of interest to engineers concerned with the operation of power plants. Every utility engineer should get copies of these government lists and check the titles of the publications which will be of aid to him in his work. He should also watch the "Books and Bulletins" column of the *Journal of Electricity* for announcements of new government publications.

Decisions of Public Service Commissions

The **Public Utilities Reports Annotated**, published by the Lawyers Co-Operative Publishing Company, Rochester, N. Y., contain all important decisions of public service commissions and state and federal courts. The decisions are issued currently in pamphlet form and are finally issued in bound form of which there are six volumes for each year costing \$5.00 per volume, with a digest costing \$2.50. This system of reporting is most valuable because many commissions do not print their decisions currently and they are not conveniently available before an annual or biennial report is issued. The **Public Utilities Reports Annotated** are also specially valuable because of the excellent analyzing and indexing of all information contained in each decision. The engineers who value utility properties and those concerned with the problems of engineering, financing and operation of utilities will find these reports indispensable in their studies of all important questions.

THE ELECTRICAL SIDE OF TRAINING AEROPLANE OBSERVERS

Conditions of aerial observation above European battlefields were so cleverly simulated at the School of Military Aeronautics at the University of California that cadets training for commissions in the Air Service got practical experience in estimating corrections for artillery fire and in conducting shoots, in spite of the fact that they were thousands of miles from the scene of an actual engagement.

The essential feature of the miniature range for the study of aerial observation is a painting of a section of the country in the same perspective as it would appear from an airplane. The painting is made on canvas, sized to be rendered translucent, and is based on a section of the artillery map given each student. The scale is such as to represent to the eye of the observer in the gallery 16 feet above, the same appearance the actual country would represent from a height of about 11,000 feet. Two balconies extend around the artillery observation room, the upper one being the observer's gallery and the lower one the gallery of the battery commander. Communication between two men working together as battery commander and observer is established through imitation wireless sets. The observer may receive messages by head telephone, signal lamp or miniature ground-strips. The battery commander always receives by head telephone.

About 500 small electric lights are set in the floor. Some of these illuminate numerals which represent definite points for the observer to locate and report. Others are points of light representing bursting shells around the 36 targets. The latter, or "bursts," are controlled by switches on the battery table, which the battery commander can operate when the signal to fire is given by the observer. The observer estimates the correction for each burst and signals it to his battery commander by wireless. Corrections are then made.

SPARKS—Current Facts, Figures and Fancy

(Post war problems as they are being met in England and in France, a suggestion of the reason for some past failures in foreign trade as typified by moving pictures in Mexico, a bit of history and various advances along electrical lines of modern day interest.—The Editor.)

It is stated that Damascus—the oldest city in the world—was the first city in Turkish territory to have electric tramways and lighting.

* * *

Recognizing a need for closer organization in attacking post-war problems, British industries are appointing joint committees to report on fundamental questions. Labor, conditions of manufacture, foreign trade policies and parliament legislation are among the problems attacked by the boot and shoe industry, for instance.

* * *

The National Kitchen tramcar in service at Halifax, England, serves an average of 700 portions per day. The car is run on routes where a half-hourly passenger service is in vogue, and stops 28 minutes at selected spots for the distribution of food. In spite of the extra cost, owing to the presence of the driver and conductor, and the cost of electricity for running the car, the venture pays its way.

* * *

Direct wireless communication between Great Britain and Australia was established last September, when two messages from England were received by the Amalgamated Wireless Company of Australasia from the new station at Carnarvon. The messages were received at Sydney perfectly clear and distinct, despite direct transmission over 12,000 miles. They were confirmed verbatim by cable on the following day.

* * *

To encourage devices and inventions calculated to improve the operation of American railroads, the United States Railroad Administration has promulgated rules and regulations designed to assist inventive genius in securing the proper attention. Provision is made for examining all models and plans and passing upon their practicability. In all cases, complete data must be forwarded to Washington and becomes a part of Federal files.

* * *

The majority of industrial accidents are unavoidable, according to a report of the "Health of Munitions Committee," and the best one can hope is to reduce their number. Contrary to the popular idea, fewer accidents occur during night shifts, because the workers settle down to a calmer mental state than in the day. The number of accidents increases also with the colder weather and decreases again as the temperature rises.

* * *

The largest private telephone branch in the world is the one which serves the expanding needs

of the U. S. War Department. It fills a specially constructed three-story brick building containing forty-four "positions," an office larger than the "central" in many a city. In equipping this branch all records for speed were broken. Messengers were summoned from distant cities under instructions to carry needed material by trunk-loads, paying excess baggage.

* * *

The problem of submersion in the first design for a submarine boat was solved by means of two side tanks into which water could be admitted through perforations and from which it could be expelled by forcing the inner side of each tank outwards. These false sides were made tight with leather suckers and moved by winding hand-screws. Although this ship was of British design, the first practical submarine was built by a Dutchman.

* * *

The iron and steel industry of France which in 1913 produced nearly 21 million tons of iron ore is to be rehabilitated as soon as possible after receiving it back from the hands of the Germans. The method is to gather the best information available regarding the extent to which iron mines, blast furnaces and steel works have been destroyed, and on this basis prepare purchase programs. Much of the special equipment needed will have to be furnished by the United States.

* * *

By the use of power planes in the ship yards some 2,000 men have been released for other service. The air planer has jumped into instant favor and been adopted by all wood yards in which it has been demonstrated. The wearing parts of the instrument are so few and so well protected that it is said not one has had to be replaced, although some have been in service ten months. In a demonstration on the coast recently a workman with the tool planed 385 square feet in five hours. Eight men working against him by hand finished 275 square feet in seven hours.

* * *

A report from Mexico shows that American motion-picture films, like other American products, would be a much more popular item than they are at present were it not for the lack of foresight of a great many of the companies sending films here to be exhibited. The familiar border scenes, which almost always show Mexicans as the villains, have time after time been sent here to wound the feelings of a very sensitive people. The reaction after the exhibition of a film of this kind is naturally very great and the popularity of American products suffers as a consequence.

PERSONALS

Ira J. Francis, who for the past eighteen months has been western manager of John A. Roebling's Sons Company



of California, has been elected president of the company to succeed Squire V. Mooney, deceased. Mr. Francis comes to his new responsibility with ideal qualifications. For many years he has served his company in varying capacities. He possesses a rare wit and humor that makes for him a host of friends on all sides. Men of the industry look forward not only to a brilliant future for him in his company's activities but they feel

that a decidedly helpful factor in the upbuilding of the industry as a whole is added by his new position of prominence and influence in his company.

John Schram, well known electrical man of Seattle, has been a recent San Francisco visitor.

H. N. Lauritzen, special Holophane representative with the Pacific States Electric Company, is in New York City.

L. R. Cady, manager of the Lassen Electric Company, Susanville, California, was among the out-of-town guests attending the annual Wass-Hael dinner at San Francisco on December 21st.

S. R. Hemphill, president of the Hemphill Trade School of Portland, has invented and patented a mechanical instrument to locate and clear short-circuits and other electrical troubles in Ford magnetos.

C. S. MacCalla, formerly general manager of The Washington Power Company with headquarters at Spokane, is now located at Schenectady, N. Y., where he is in the employ of the General Electric Company.

H. F. Jackson, president and general manager of the Sierra and San Francisco Power Company, who has spent recent weeks in New York City and at the national capital, has returned to San Francisco.

G. E. Emmons, vice-president of the General Electric Company, in charge of the manufacturing end of the company, has been a recent visitor to the Pacific Coast where he spent some time in San Francisco.

Chas. E. Oakes, associate electrical engineer of the Bureau of Standards, has recently spent some time on the Pacific Coast in the interest of greater cooperation between the Bureau and electrical interests of this region.

C. B. Merrick, who severed his connection with the Journal of Electricity last June to become an instructor in the Aviation School at Berkeley, California, is again at his post in the circulation department of the Journal of Electricity.

Tracy E. Bibbins, president of the Pacific States Electric Company, has undergone a severe operation at St. Luke's Hospital in San Francisco. From latest reports it is surmised that Mr. Bibbins is recovering as nicely and as rapidly as can be expected.

C. E. Ingalls, who has been joint sales representative of the Crocker-Wheeler Company at San Francisco with W. K. Brown, has been appointed district manager at San Francisco coincident with Mr. Brown's appointment as district manager at Newark, N. J.

Harvey W. Brundidge of the Los Angeles Express and Irving Martin of the Stockton Record are the two new ap-

pointees of the California Railroad Commission. The vacancy caused by the resignation of Max Thelen last June to enter war work at Washington has not as yet been filled.

George A. Pope has resigned from the directorate of the Federal Telegraph Company, the operating company for the Poulsen Wireless Corporation. The vacancy caused by Mr. Pope's resignation has been filled by the election to the directorate of Hiram Johnson, Jr.

L. B. Jones, assistant gas engineer for the Pacific Gas & Electric Company, is again back at his work in San Francisco after an absence of several weeks at camp where he was undergoing training for a commission, as announced at some length in the columns of the Journal of Electricity, October 15, 1918.

Brigadier-General George H. Harries, in civilian life a vice-president of H. M. Byllesby & Company, was the ranking member of three American officers first to reach Berlin since the signing of the armistice. General Harries and his aides arrived in Berlin December 10th, as members of the American commission for the repatriation of war prisoners.

Geo. F. Swain, professor of civil engineering at the Massachusetts Institute of Technology and Harvard University and a distinguished consulting engineer well known to the West, is one of the American engineers chosen to go to France to sit with French engineers on problems of reconstruction. He will be abroad for something like six weeks on this work.

F. P. Gay, New York manager of the Pelton Water Wheel Company with headquarters in New York City, was a recent attendant at the annual convention of the American Society of Mechanical Engineers and Western delegates, who had known Mr. Gay as the J. G. White & Company representative in San Francisco in former years, found him interesting and enjoyable as ever.

E. J. Schneider has been elected president of the San Francisco chapter of the A. S. C. E. with M. M. O'Shaughnessy, city engineer of San Francisco, as vice-president and Nathan A. Bowers, western editor of the McGraw-Hill Publishing Company, as secretary. The organization has been holding very active meetings and has entered into cooperation with electrical and mechanical engineering societies in their joint meetings.

Harry Coe, vice-president and formerly assistant cashier of the Anglo and London Paris National Bank, has been promoted to the position of cashier of the institution, to succeed Challen R. Parker, who left the bank recently to accept a position with the Guaranty Trust Company of New York City. Mr. Coe is well known to the readers of the Journal of Electricity through his articles on oriental finance which have appeared in these columns.

Major George F. Sever, western representative of the Chief of Army Engineers, U. S. A., who has been actively



assisting the War Industries Board for some months past in matters connected with the power situation in the West, has closed his offices in San Francisco and returned to Washington, D. C. The fruits of Major Sever's labors are set forth on other pages of this issue. His investigations have been painstaking and accurate and will undoubtedly serve to hasten a more workable water power legislation being enacted by Congress.

The best wishes of men of the industry go with Major Sever in his return to Washington, as it is felt that he has been a faithful and efficient public servant in the performance of his difficult duty in the West.

W. R. Putnam, salesmanager of the Utah Power and Light Company, has returned to Salt Lake City after a profitable and interesting trip to the Atlantic City conference of the National Chamber of Commerce, where four thousand delegates assembled from all over the nation to discuss reconstruction problems. On his return west he visited the Taylor-Street Plant of the Edison Electric Appliance Co., Inc., at Chicago, where a luncheon was served in his honor and in honor of Ribert Sibley, editor of the Journal of Electricity, who was also en route home from the reconstruction conference of the A. S. M. E. held recently in New York City. The hosts of the pleasant occasion were Geo. A. Hughes, president, John D. Cross, plant manager, C. P. Randolph, chief engineer, E. H.



Richardson, inventor of the Hotpoint Iron, and C. M. Lindsay, assistant to the president. About five hundred employees are busily engaged at this plant manufacturing electric ranges varying in size from the toy to the vast bake oven for commercial practice, in addition to a large government order for helmets and gloves to be used in the aeroplane service. A highly developed spirit of loyalty and enterprise pervades the establishment and the electrical man from the West will find much of profit and interest in visiting an establishment of this high standard of excellence.

H. J. Gille, sales manager of the Puget Sound Traction Light and Power Company, has been chosen president of the Northwest Electric Light and Power Association by the executive committee to take the place of L. B. Faulkner, who resigned on account of pressure of work in his new duties as president of the Olympia Light and Power Company.

Lieutenant A. E. Burghduff, formerly engineer for the Home Telephone Company of Portland, Oregon, who enlisted in November, 1917, in the officers' training camp in San Francisco and who is now in France, recently was promoted to a captaincy. Captain Burghduff was one of the first four men to get commissions from the O. T. C. in San Francisco.

H. H. Jones, general manager of the San Diego Consolidated Gas & Electric Company, has been appointed chairman of the Pacific Coast Section N. E. L. A. convention which is to be held in Coronado this spring. Mr. Jones has already made a reputation for his section of the country in hospitality through the most delightful convention of the Pacific Coast

Gas Association which he directed some years ago—and a most successful gathering is promised under his able management.

E. H. Richardson, inventor of the "Hotpoint Iron," who has for the past several months been engaged in New York City, Schenectady and Chicago in work related to the Edison Electric Appliance Co., Inc., has returned to California. Mr. Richardson joined his wife and daughter at Berkeley, California, where his daughter is attending college, and from there motored to his home in Ontario, California, the home, too, of the "Hotpoint Iron."

Challen R. Parker, formerly cashier of the Anglo London Paris National Bank, is now vice-president of the Guaranty Trust Company of New York City, a banking corporation with five hundred million dollars deposits. This is the same institution to which Willis Booth of Los Angeles, chairman of the Board of the Edison Electric Appliance Co., Inc., goes on January first as vice-president, as announced in the last issue of the Journal of Electricity. This great financial institution of New York City is manifesting its confidence in the future of the Pan Pacific area by sending fourteen banking experts to the Orient in opening up oriental connections under the name of the Asia Banking Corporation.

OBITUARY

Harry L. Bleecker, vice-president and general manager of The Washington Water Power Company, died in New York City while on a visit to that metropolis, on Dec. 11, 1918, of pneumonia following a severe cold and a slight attack of influenza. Mr. Bleecker was 45 years old and since coming to Spokane 16 years ago has been continuously associated with power development in the great Inland Empire of the Northwest. He was recognized as an able builder. Typical of his readiness to help every factor engaged in the upbuilding of the West was his recent emphatic endorsement of the Journal of Electricity and its work in which he wrote: "I would say that it is more closely read than any other publication of its class that we receive, and we look for its receipt with keen pleasure." His loss to the power industry in the West will be keenly felt.

Thomas S. Nelms, salesman with the Pacific States Electric Company at San Francisco, died recently at his home in Mill Valley of influenza. During the past few weeks Mr. Nelms, who was on his annual furlough, had been devoting his time to caring for those stricken with the disease. His loss is deeply felt by the many who knew him well.



A PROMINENT GROUPING OF THE RECENT ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

In this view are to be found The Council, Local Sections Delegates and the Committee on Aims and Organization. This convention was held in New York City, Dec. 3-6, 1918. Two delegates were called east from west of the Rocky Mountains—Robert Sibley, editor of the Journal of Electricity at San Francisco and Chas. H. Repath, a noted metallurgical engineer of Los Angeles.

The keynote of the conference proved to be the strong plea presented by the Section's delegates to give greater emphasis to develop strong local sections of the Society throughout the Nation. The report of the San Francisco delegate emphasizing this feature is found in full elsewhere in this issue.

MEETING NOTICES FOR ELECTRICAL MEN

(Christmas meetings were held by most of the electrical organizations up and down the coast during the last two weeks—and various informal gatherings are planned for the new year. A service bureau is planned by the engineering organizations of the San Francisco bay region which should help in the adjustment of employment questions with the technical men who have returned to civil life from the army.—The Editor.)

San Francisco Electrical Development League

The San Francisco Electrical Development League held a Christmas luncheon on Monday, Dec. 16th, at the Palace Hotel. Stunts and poems were the order of the day. Chief among these were the new invention featured by Tracy Simpson and the poem by E. M. Cutting in honor of the recent toastmaster of the Supply Jobbers' convention at Del Monte. A most interesting address was given by Alfred Holman, editor of the Argonaut, who spoke on "War Torn Europe" as he had opportunity to observe it in his recent trip through that region.

The meeting of Dec. 23rd was Kiddies' Day and wives and children were invited to enjoy the tree and the Christmas spirit.

Jovian Electric League of Los Angeles

The Jovian Electric League of Los Angeles, with a wish to cooperate with the City Health Department in stamping out the recent outbreak of influenza has postponed indefinitely its Wednesday luncheons. Miss Gertrude Tucker of the Southern California Edison Company is to be chairman of the Ladies' Day which will be a feature of the league as soon as the Health Board permits. The bulletin which makes this announcement is further enlivened with poems and news items.

Oregon Drainage Congress

The annual meeting of the Oregon State Drainage Association will be held in Portland at the Imperial Hotel on January 8th. The meeting will be held in conjunction with the session of the Oregon Irrigation Congress and many matters of importance in irrigation and drainage work will be up for discussion.

A complete program has been prepared, including talks by W. J. Kerr, president of the Agricultural College; Dr. Samuel Fortier, chief of the Federal Drainage Investigations; Edgar B. Piper, editor of The Oregonian; Dr. Elwood Meade, and others.

Seattle A. I. E. E.

At the meeting of Dec. 17, 1918, the Seattle section of the A. I. E. E. enjoyed a discussion of the paper by H. A. Horner on "Electric Welding—a New Industry." The paper was one which appeared in the October Proceedings—and was discussed by members from its various angles and local aspects.

The Engineers' Service Bureau

A service bureau is being established by cooperation of the San Francisco Sections of the Am. Soc. C. E., Am. Inst. E. E., Am. Soc. M. E., Am. Soc. Min. Eng. and the Amer.

Chemical Society. It is a joint endeavor on the part of the several sections to provide a clearing house (1) through which engineers in search of employment may get in touch with prospective employers and (2) through which employers may find technical men promptly as they are needed.

The bureau is to be provided with as complete a list of engineering vacancies as it is possible to compile and endeavor will be made to keep this list up to date. Applicants will write their qualifications and experience on a blank form and send them in by mail. As these applications come in they will be compared with the "engineers wanted" list. If a call is found for a man with the qualifications given, the applicant will be notified at once. Otherwise his application will be filed without acknowledgment awaiting a call. Blanks may be had at the office of the secretary of each of the five sections. Applications must be mailed to "Service Bureau," Engineers' Club, 57 Post street, San Francisco. The Service Bureau will give information to applicants only by mail or telephone. As the matter cannot be handled otherwise, there will be no exceptions to this rule against receiving applicants in person.

Portland Electrical Contractors and Dealers

The regular semi-monthly meeting of the Portland District of Electrical Contractors and Dealers met in room 248 of the Oregon Hotel Monday evening, Dec. 9, 1918.

Portland Electrical Contractors and Dealers

The State of Association committee reported progress; the committee on Wiring Schedule reported that owing to the sickness of E. W. Pierce it was unable to hold a meeting but that they

would have a report in by the next meeting.

The chairman reported that the city planned having a public Christmas tree celebration at the Liberty Court Christmas Eve, and asked that the contractors' association donate the illumination. He further reported that the union would furnish the labor necessary, and it was up to the contractors to furnish the necessary streamers and lights. Upon a motion made by Mr. W. O. Fouch it was decided to cooperate with the general committee in this program, and upon a further motion a committee of three, in addition to the chairman, was appointed to attend to final details. Those appointed as a committee were: J. H. Sroufe, chairman, F. C. Green, W. F. Murphy and Frank Pierce.

The committee appointed to investigate in regard to the Friday Electric Page reported, through the secretary, that from then on until Christmas they intended to publish in the page cuts of electrical appliances and boost the giving of electrical appliances for Christmas gifts.

BUILDERS OF THE WEST—XLIV.



JOHN H. LEWIS

Unification of the water code, making possible a workable plan for the utilization and safeguarding of the most valuable asset of the great West—namely, its vast water resources—has in large measure been the contribution of John H. Lewis, until recently state engineer of Oregon, to the upbuilding of the West. It is with unusual pleasure that the Journal of Electricity dedicates this issue, devoted to Reconstruction Problems, to Mr. Lewis, the new engineer-manager of the Warm Springs Irrigation District at Vale, Oregon, and wishes him godspeed in the vast reclamation development he now has in charge.

A get-together dinner staged by the San Francisco Development League and the Pacific Coast Section N. E. L. A. to awaken mutual interest in the two organizations and in general to prepare the way for a successful spring convention of the N. E. L. A. at Coronado. The time of this convention has not been definitely set but it will probably be held some time in May. The exact date will be determined at a meeting of the executive committee on Jan. 4, 1919 in Los Angeles.



Under new business J. C. English proposed a motion that a committee of three be appointed to draft suitable resolutions in regard to the death of R. C. Kingery.

At this time the Legislative Committee having an exhaustive report upon recommendations as to new provisions in the city electrical code, the meeting was turned over to the chairman of the Legislative Committee, F. C. Green, and the balance of the evening was devoted to the discussion of part of the proposed changes, the discussion lasting until ten o'clock, at which time, on account of the lateness of the hour, the meeting adjourned without completing discussions and recommendations in regard to the proposed revision.

The Electrical Get-Together Dinner at San Francisco

The electrical men of San Francisco and vicinity, to the number of 233, enjoyed a dinner and entertainment at the San Francisco Commercial Club, Dec. 13th, under the joint auspices of the Pacific Coast Section N. E. L. A. and the Electrical Development League. Major Geo. F. Sever, U. S. Engineer Corps, as toastmaster, introduced the various entertainment features and speakers in a most effective manner. The subjects of the evening included: A. H. Halloran, "N. E. L. A.," Garnett Young, "The League," M. A. De Lew, "The Contractor-Dealer," Lee H. Newbert, "The California Co-operative Electrical Campaign," R. L. Eltringham, "New Electrical Safety Legislation," and Minor Chipman, "Human Efficiency."

Great credit is due to the committee having the affair in hand for the able manner in which the arrangements were

carried out and the large attendance that was attained through their efforts. The members were Albert Meinema, Earl Fisher, R. F. Behan, Clay Ingalls, Robt. Eltringham and Tom Bennett.

This is the first of a series of such mid-year dinners to be initiated by the Pacific Coast Section N. E. L. A. The paper by M. A. De Lew on contractor-dealer problems will appear in the next issue of the Journal of Electricity.

POSITIONS SOUGHT FOR ARMY OFFICERS NOW LEAVING CAMPS IN UNITED STATES

The United States Employment Service has issued an appeal to employers in need of technical and other highly trained men to take on qualified men from the commissioned and enlisted ranks of the army who are now leaving the camps. Hundreds of officers, many of the higher ranks, are asking the camp representatives and Federal directors of the Federal Employment Service for the States to assist them to obtain new employment. There also are large numbers of enlisted men qualified for professional and technical positions who are leaving the army without having positions in sight. Among the men of this high type applying at the Federal Employment Service are engineers and other technical men, executives, chemists, statisticians, purchasing agents, employment managers, cost accountants, etc. All employers wishing to get in touch with these men should communicate with the professional section, United States Employment Service, Department of Labor, Washington, D. C.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—J. H. Cunningham, Southern California Edison Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club.
Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section

Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.

Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock, Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
 Chairman—A. J. Swank, University of California, Berkeley, Cal.
 Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
 Chairman—Albert S. Anderson, Boulder.
 Secretary—Terrill C. Smith, University of Colorado, Boulder.
 Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
 Chairman—V. Pearson, Moscow, Idaho.
 Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
 Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
 Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
 Secretary—L. H. Hapgood, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
 Chairman—C. H. Suydam, Stanford University.
 Secretary—Frank Miller, Stanford University.

Montana State College Branch
 Chairman—Roy C. Hagen, Montana State College, Bozeman, Mont.
 Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
 Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
 Chairman—R. C. Richards.
 Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
 Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
 Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
 Chairman—Clarence E. Guse, Pullman.
 Secretary—Ralph C. Guse, State College of Washington, Pullman.
 Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
 Chairman—W. Creighton Peet.
 Secretary—Harry C. Brown, 110 West 4th St., New York.
 Executive Committeemen-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggard, Portland.

British Columbia Ass'n Electrical Contractors and Dealers
 President—E. Brettell, Vancouver, B. C.
 Secretary—Capt. W. J. Conway, Vancouver, B. C.
 Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
 President—H. C. Reid, 507 Montgomery St., San Francisco.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
 President—J. M. Carlson, 175 Jessie St., San Francisco.
 Secretary—J. W. Asher, 601 Howard St., San Francisco.
 Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and Dealers
 President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
 Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
 Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
 President—W. Cox, Santa Cruz.
 Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
 President—F. V. McAvoy, 138 N. Canter St., Reno.
 Secretary—R. W. Shearer, 215 Sierra St., Reno.
 Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
 President—R. C. Kenney, Portland.
 Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers
 President—J. H. Sroufe, Jaggard-Sroufe Co., Portland.

Sacramento Section, California Electrical Contractors & Dealers' Association
 President—W. H. Gribble, Sacramento.
 Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers
 President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
 Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
 Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
 President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
 Secretary—Forrest E. Smith, Seattle, Wash.
 Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association
 General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
 Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
 President—W. S. Berry, Western Electric Company, San Francisco.
 Secretary—Albert H. Elliot, 544 Market St., San Francisco.
 Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast
 President—C. L. Gilson, Gilson Electrical Supply Co., 304-12th St., Oakland, Cal.
 Secretary—Albert H. Elliot, 544 Market St., San Francisco.
 Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign
 Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

National Electric Light Association
 President—W. F. Wells, Edison Elec. Illuminating Co., Brooklyn.
 Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.

Nevada Section, N. E. L. A.
 Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.
 President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
 Secretary—A. H. Halloran, Journal of Electricity, Crossley Bldg., San Francisco.
 Meetings—Annually, in April.

Portland Section, N. E. L. A.
 Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.
 Secretary—F. H. Murphy.

Illuminating Engineering Society
 President—George A. Hoadley.
 Secretary—Clarence L. Law.

Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
 Meetings—First Tuesday each month.

New Mexico Electrical Association
 President—M. R. Buchanan, Silver City, N. M.
 Secretary—E. M. Haggerson, Silver City, N. M.
 Meetings—Annually, in February.

Southwestern Electric and Gas Association
 President—W. A. Sullivan, Shreveport, La.
 Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
 President—L. B. Faulkner, Olympia Light & Power Co., Olympia, Wash.
 Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
 Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

New officers announced later.

Los Angeles Jovian Electrical League
 President—A. E. Peat, San Joaquin Light & Power Corp.
 Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
 Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
 President—Garnett Young, 612 Howard St., San Francisco.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metersmen's Association
 President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.

Secretary—A. E. Coney, Great Western Power Company, San Francisco.
 Meetings—About every 60 days.

Alameda County Electrical Club
 President—George Drew, Pacific States Electric Company, Oakland, Cal.
 Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
 Secretary—H. N. Beecher, City Hall, L. A.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
 President—W. H. Brammage, Pacific Tel. & Tel. Co., San Francisco.
 Secretary—Chas. H. Dodson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
 President—Charles T. Main, Engineering Society Bldg., New York City.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
 President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
 Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
 Meetings—Quarterly.
 Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
 President—Charles H. McGuire.
 Secretary—T. J. Royer.
 Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
 President—Orrin E. Stanley, Box 973, Portland, Ore.
 Secretary—C. J. Hogue, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
 President—J. F. Pinson, Seattle, Wash.
 Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
 Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
 President—A. E. Chandler, New Call Bldg., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.
 Annual Meeting: October.

Idaho Society of Engineers
 President—W. H. Gibson, Mountain Home, Idaho.
 Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
 President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
 President—George S. Nickerson, 914 Forum Bldg., Sacramento.
 Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
 Chairman—C. D. Marx, Stanford University.
 Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
 President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.

Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
 Meetings—Annual.

Portland Section A. S. C. E.
 President—P. H. Dater, Eng. U. S. Forestry Service.

Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
 Meetings—At call of president.

Spokane Engineering & Technical Ass'n
 President—J. C. Ralston, E. M., E. E.

Foreign Trade Club
 President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
 President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
 Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
 Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

CAPITAL ISSUES COMMITTEE

Washington, December 25.—The Capital Issues Committee of the Treasury, the Government's war agency for the suppression of unessential security issues, has announced that it will suspend activities on December 31 and remain inactive until dissolved unless called back into service by developments.

NEW TELEGRAPH LINES BETWEEN JAPAN AND MANCHURIA

The communication between Japan and Manchuria has increased so much of late that the present telegraph lines are quite inadequate. A proposal has been made to add a new route besides the existing two routes. The new route will reach Manchuria via Chosen and will be completed within two years, the total cost being 840,000 yen (\$420,000).

RESOLUTIONS ON THE DEATH OF SQUIRE V. MOONEY

The following resolution has been adopted by John A. Roebling's Sons:

We, the Board of Directors of the John A. Roebling's Sons Company of Trenton, New Jersey, wish to express our deep regret and great loss occasioned by the death of Mr. S. V. Mooney of San Francisco, who died August 29, 1918.

Mr. Mooney came into our employ in 1879 from a prominent position with another organization and, being then possessed of a valuable knowledge of pioneer conditions of the West, he became our agent at Virginia City, Nevada.



Keen of perception, with an unusual future perspective, his unerring judgment rapidly led us into an expanding western business. It was our pleasure to repeatedly advance him to more important positions of trust and responsibility and, finally, to appoint him to the place which he occupied at the time of his death, that of President of the John A. Roebling's Sons Company of California, in control of our entire Pacific Coast trade, with branches at Seattle, Portland, San Francisco and Los Angeles.

During almost forty years of continuous service we

have found Mr. Mooney to be a faithful employe, a man of sound judgment and absolute integrity, discharging thoroughly and with a willing spirit his every obligation. As a real founder of our western trade, we have for many years looked upon him in a peculiar sense as one of our most confidential advisers.

Untiring in his efforts in our behalf and ever mindful of our interest, yet he possessed those rare traits of character which commanded the respect of the trade and endeared him to the corps of assistants, of which he was the employer and executive head. His splendid history with us has compelled us to regard him as a man of exceptional worth, and we mourn Mr. Mooney's loss as that of a real personal friend.

TRADE NOTES

A Change of Location —

The McGlauflin Manufacturing Company, manufacturers of insulator pins, pole tops and the like, formerly located in San Rafael, has moved its plant to Petaluma.

A New Calendar —

The Youngstown Sheet & Tube Company's annual calendar for 1919 is out and is, perhaps, the handsomest of the interesting series issued by that company. It contains twelve new views 8 by 15 inches, in two colors, each showing one of the spectacular operations in a modern steel mill. The illustration on the front page is a night view of the main plant while it was speeded up on war work and flood-lighted as a war time precaution. This picture was made from a photographic plate which had been exposed two hours and is regarded as an especially fine example of night photography.

A Sales Conference —

During the week ending December 7th, The Cutler-Hammer Manufacturing Company held a five-day sales conference in Milwaukee for the benefit of its men who direct the district office sales of wiring devices, push button specialties, and molded insulation. The conference was in charge of Mr. W. C. Stevens, sales manager, Mr. A. H. Fleet, manager of Wiring Devices Department, and Mr. Ed. Karl. New devices, methods of manufacturing wiring devices and molded insulation products, advertising and selling plans with special reference to increased sales during the reconstruction period, were some of the important subjects taken up.

Personal Items —

L. E. Townsley, manager of the Foreign Trade Department of Paul R. Ruben & Company, San Francisco, leaves the last of January for China, Japan, Philippines, Dutch East Indies, Straits Settlements and Australasia, to establish resident agents at principal ports.

The Edison Storage Battery Company of Orange, New Jersey, announces the appointment of Geo. F. Simons as district sales manager of their Detroit district. Mr. Simons succeeds Mr. Bertram Smith, who was recently called to the main office at Orange, New Jersey, in the capacity of assistant general sales manager.

Geo. A. Hughes, president of the Edison Appliance Company, is a member of the Rotary Club of Chicago and in a recent Christmas publication of that organization was listed with his picture and a brief description of the products of his company. The roll call of members and this brief advertisement was most effective and suggests a method of co-operation which might be carried out by Rotary clubs farther West.

Prescott C. Ritchie, western representative of the Westinghouse Automobile Equipment Department, moved his headquarters from Indianapolis to the Conway Building, Chicago, on December 1st. Mr. Ritchie has had extensive

experience in auto electric equipment here and has been with the Westinghouse Electric Company for several years.

M. Frankel, now manager of the Chicago office of the Roller Smith Company, has been promoted to the position of assistant sales manager.

J. F. Killeen has become associated with the Edison Electric Appliance Company, Inc., having resigned from the

Rathbone, Sard Electric Company of Albany, N. Y., of which he was vice-president and sales manager. The Edison Electric Appliance Co. will have the benefit of his broad experience in the heating device business, of which he has an exceptional grasp, plus a quick, intuitive judgment ripened in a varied career touching many phases of life, all of which makes him a keen and unusually accurate



judge of situations involving the human element. In 1907 Mr. Killeen decided to get into the electric business, starting from the bottom. Coming from Troy, N. Y., where he always lived, he began with the General Electric Company at Schenectady, in the manufacturing department. Rapidly passing through various positions in the production, advertising and heating device commercial departments, he became manager of the last in 1915, leaving in 1916 to become vice-president of the Rathbone, Sard Electric Company, a subsidiary of the makers of the well-known "Acorn" coal and gas ranges. Mr. Killeen has a wide acquaintance and many friends among commercial central station men and electrical jobbers.

RECONSTRUCTION CONVENTION OF THE CHAMBER OF COMMERCE OF THE UNITED STATES

A new and powerful federation of American industries was created at the Reconstruction Congress of Industrial War Service Committees which has recently come to an end at Atlantic City. This Association, made up of the nearly 400 War Service Committees that were formed under the direction of the Chamber of Commerce of the United States, was created by the Committees to act in the future as the spokesman for industry before the Government just as the Committees acted separately as the point of contact between the industry and the Government during the war period.

The Federation voted to function under direction of a Committee of the Chamber of Commerce and it will have back of it and serving it the Chamber's organization. When necessary it will have, too, the benefit of the weight of the expression of the membership of the Chamber. The chairman of the War Service Committees will sit as an Industrial Advisory Council to the organization.

The views of this assemblage of industries respecting industrial readjustment were expressed at Atlantic City in a series of resolutions covering the most important subjects that today engage the attention of business men. These resolutions, most of them adopted without a dissenting voice, are given in part as follows:

Cancellation of War Contracts

It is in the public interest that all war orders placed by any contracting agency of the government and accepted in good faith, whether formally and regularly executed or not,

should, upon cancellation by such contracting agency, be promptly and equitably adjusted and satisfied as if every formality had been observed, and when so adjusted the amount ascertained to be due by the government should be promptly paid, to the end that these funds may be utilized by the industries of the country to speed their transition from a war to a peace basis.

Removal of Restrictions on Industry

It is in the public interest that all war regulations of industry should be revoked, and all war restrictions on industry should be removed, as speedily as practicable, save in the case of such industries as are engaged in the production, preparation or distribution of foods, feeds, and fuel, and such last-named group of industries should be freed from war regulations and restrictions as early as consistent with the welfare of this nation and the Allies.

Pivotal Industries

It is essential that the government should at once proceed to ascertain the industries which have been developed during the European war and ascertain those the maintenance of which is indispensable for the safety of our industrial structure and our military establishment.

When these pivotal industries have been ascertained, means suitable in view of their nature and situations should at once be provided for their encouragement and preservation.

Industrial Cooperation

The war has demonstrated that through industrial cooperation great economies may be achieved, waste eliminated, and efficiency increased. The nation should not forget, but rather should capitalize, these lessons by adapting effective war practices to peace conditions through permitting reasonable cooperation between units of industry under appropriate federal supervision. It is in the public interest that reasonable trade agreements should be entered into, but the failure of the government either clearly to define the dividing line between those agreements which are, and those which are not, in unreasonable restraint of commerce, or to provide an agency to speak for it on application of those proposing to enter into such agreement, in effect restricts wholesome cooperation and deprives both industry and the general public of its benefits. The conditions incident to the period of readjustment renders it imperative that all obstacles to reasonable cooperation be immediately removed through appropriate legislation.

Federal Trade Commission

The Federal Trade Commission was advocated by the President, and was created, as an agency to make the administration of our trust legislation explicit and intelligible, and to provide "the advice, the definite guidance and information" which business enterprises require. The normal importance of the Commission's task is now tremendously increased by the imperative need for wholehearted and sympathetic cooperation between the government and industry, especially during the readjustment period, and suggests the desirability of the two existing vacancies in the Commission's membership being promptly filled with able men of broad business experience and clear vision, prepared to assist actively in discharging these tasks along constructive lines.

Industrial Relations

The convention heartily endorses in letter and spirit the principles of the industrial creed so clearly and forcibly stated in the paper read to it Thursday morning by Mr. John D. Rockefeller, Jr., and urges upon all units of industry,—where they may not now be employed,—the application of such principles. Without approving or rejecting his particular plan or machinery, the principles advanced by Mr. Rockefeller are as follows:

1. Labor and capital are partners, not enemies; their interests are common interests, not opposed, and neither can attain the fullest measure of prosperity at the expense of the other, but only in association with the other.

2. The purpose of industry is quite as much to advance social well-being as material well-being and in the pursuit of that purpose the interests of the community should be carefully considered, the well-being of the employees as respects living and working conditions should be fully guarded, management should be adequately recognized and capital should be justly compensated, and failure in any of these particulars means loss to all.

3. Every man is entitled to an opportunity to earn a living, to fair wages, to reasonable hours of work and proper working conditions, to a decent home, to the opportunity to play, to learn, to worship, and to love, as well as to toil, and the responsibility rests as heavily upon industry as upon government or society to see that these conditions and opportunities prevail.

4. Industry, efficiency, and initiative, wherever found, should be encouraged and adequately rewarded and indolence, indifference, and restriction of production should be discountenanced.

5. The provision of adequate means for uncovering grievances, and promptly adjusting them, is of fundamental importance to the successful conduct of industry.

6. The most potent measure in bringing about industrial harmony and prosperity is adequate representation of the parties in interest; existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and are adaptable to the peculiar conditions in the various industries.

7. The application of right principles never fails to effect right relations; the letter killeth and the spirit maketh alive; forms are wholly secondary while attitude and spirit are all important, and only as the parties in industry are animated by the spirit of fair play, justice to all, and brotherhood, will any plans which they may mutually work out succeed.

8. That man renders the greatest social service who so cooperates in the organization of industry as to afford to the largest number of men the greatest opportunity for self-development and the enjoyment by every man of those benefits which his own work adds to the wealth of civilization.

Relocation of Labor

The conversion of the industry of the country from a peace basis to a war basis involved a general and important dislocation of labor. This movement was gradual. The end of the war involves a much more rapid change in industry; while there will be a great demand for labor to meet the foreign and domestic requirements there may be for a time in special places a temporary condition of unemployment.

In the new relations of industry to labor we conceive it to be incumbent upon the community affected promptly to meet such conditions.

The local chambers of commerce should be able to contribute in an important way in this work.

Public Works

The development of public works of every sort, as recommended by the President, should promptly be resumed, in order that opportunities of employment may be created for unskilled labor.

Taxation

The cessation of hostilities brings to business interests a feeling of deep concern in the matter of taxation. The problems of readjustment are made more difficult through inequalities in the present law.

We believe, therefore, that in the consideration of amendments to the present act, or the passage of new revenue legislation, the Congress should give most careful consideration to the views expressed by organizations of commerce and industry. Ability to pay, inventory values, and proper reserves, together with careful survey of the amount of revenue required under the new conditions, are matters of vital importance to business interests of the nation during this readjustment period.

Inventories

We urge that Congress should give careful consideration to the grave menace now facing all industry due to the fact that both raw materials and finished goods are carried in full measure to meet the extraordinary requirements of the government and of the people, and that in large part the stocks have been acquired at abnormal cost and are therefore carried into inventories at inflated values, thereby showing apparent profits which have not been realized, and which probably will never be fully realized. These are largely bookkeeping or "paper" profits, and should not be used as a basis for taxation.

We therefore recommend that any tax law shall provide that during present conditions the taxpayer shall be allowed to make a deduction from his apparent profit by way of a reserve for a subsequent shrinkage in the value of merchandise.

We believe that the interests of the government can be protected against abuse of this privilege by the fixing of a maximum percentage of deduction to be allowed, and by the use of proper methods of inspection and appraisal.

Railroads

The Congress of the United States should speedily enact legislation providing for the early return under federal charters to their owners of all railroads now being operated by this government under federal regulations permitting the elimination of wasteful competition, the pooling of equipment, combinations or consolidations through ownership or otherwise in the operation of terminals, and such other practices as will tend to economize without destroying competition in service.

Means of Communication

We are opposed to government ownership and operation of telegraphs, telephones, and cables.

Merchant Marine

We recommend that the construction of a great merchant marine be continued and amplified, and that its operation under American control be kept safe by such legislation as may be necessary to insure its stability and its lasting value to American industries.

Public Utilities

Public utilities have faced difficult problems, which have been accentuated by conditions arising out of war. The development and efficiency of such a utility as local transportation has immediate importance for every community. It is recommended that the Chamber of Commerce of the United States should appoint a committee to investigate and study the question of local transportation as it relates to the control of rates and service, franchises, taxes, the attraction of capital into the business, and such other questions as the committee may find pertinent. Such a committee should report its recommendations to the Board of Directors of the National Chamber, and the Board should deal with them in accordance with the established procedure of the Chamber.

Water Powers

Industrial activity is dependent upon the available supply of power. A bill which would effect the development of hydroelectric power upon waterways and lands which are subject to Federal jurisdiction is now before a committee of conference between the two Houses of Congress. It is important in the public interest that Federal legislation on this subject should be enacted without further delay. We accordingly urge that the conference committee arrive at an acceptable form of legislation in season for enactment at this session of Congress.

Markets for Foreign Trade

We strongly urge upon our government the vital necessity of encouraging and developing our foreign trade through all appropriate means possible, in order that the production of industry may afford employment to wage earners and prosperity to the nation.

Cost Accounting

It is the sense of this Convention that a system of uniform cost accounting should be adopted by each industry.

National Trade Association

The experiences of the war have clearly demonstrated the value of national trade organizations and their service to the country as well as to industry.

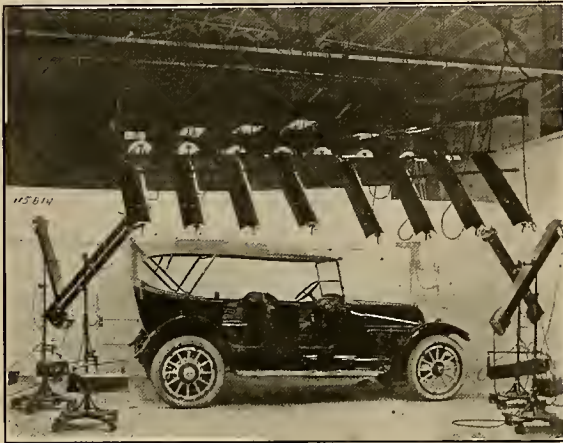
This conference heartily approves the plan of organizing each industry in the country in a representative national trade association and expresses the belief that every dealer, jobber, manufacturer, and producer of raw materials should be a member of the national organization in his trade and cordially support it in its work.

LATEST IN EVERYTHING ELECTRICAL

(Electricity has many applications to the photographer's art, of which a rather new feature is here recorded. Suggestions for coal saving by the prevention of smoke and a valve control which is motor operated and may be controlled from a distance are further taken up as appropriate to the needs of the present period.—The Editor.)

MERCURY VAPOR LAMPS TO PHOTOGRAPH OVERLANDS

For several reasons an automobile is a difficult subject for studio photography. On account of its size, a large light-source is needed and since its color is usually black, blue, red or some other dark color, plenty of light must be available.



Photographing a car with mercury vapor lamps

Then there are often details in the shadows which must be shown to the satisfaction of the salesman, who are accustomed to scrutinize photographs closely.

All these points have been met by an installation of 20 Cooper-Hewitt mercury arcs in the studio of the Willys-Overland Company at Toledo. Eight lamps are suspended horizontally over the car and eight at an angle of 45 degrees. This general illumination is reinforced by four tubes mounted on individual stands, placed so as to light up spots which need extra intensity. Owing to their highly actinic light, these lamps shorten the exposure, while their form increases the diffusion of the light, and so eliminates the reflection of bright spots on the side of the car.

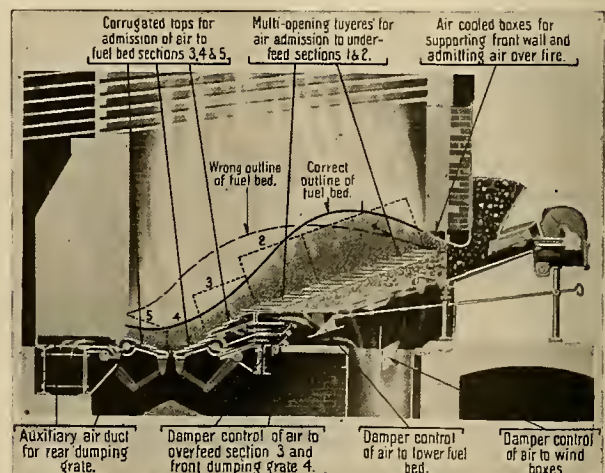
SMOKE PREVENTION—COAL SAVING SUGGESTIONS

Just at this time when the conservation of coal is under special consideration, every one realizes that smoke issuing from boiler stacks represents unused heat units, but everyone does not realize that certain simple rules, if observed in the fire room, will materially decrease this loss. The suggestions herein are based on many years' experience of the Westinghouse Electric & Manufacturing Company's combustion engineers and are briefly outlined below.

1. Give your fireman an opportunity to acquire the fundamental principles of fuel burning.
2. If you have a difficult fuel problem, consult a combustion engineer.
3. Prevent smoke by proper firing methods.
4. Use gauges to indicate exactly the condition of fire bed at all times. As a minimum these gauges should consist of draft gauge indicating draft in furnace above fuel bed, draft gauge indicating draft at boiler side of flue damper and a steam meter for individual boilers.
5. CO₂ is the principle product of complete combustion of coal. Ten to twelve per cent CO₂ should be obtained in flue gases to insure minimum fuel loss.

6. Avoid loss due to unburned coal in the ash.
7. If you are wasting exhaust steam, you are wasting coal.
8. Do not permit grates to clog. A systematic method of keeping the air spaces clean must be followed.
9. Inspect the baffles in boilers, as broken or leaky baffles raise the flue gas temperature and waste coal.
10. Avoid leaking in of cold air around boiler setting.
11. Install stokers. Hand firing is rapidly being recognized as an obsolete and wasteful method of firing.
12. Clean scale from tubes, as every particle of scale represents wasted coal.
13. Avoid soot formation. All boiler tubes should be blown externally once every eight hours when in continuous service.
14. All smoke flues should be as short and straight as possible. Flues should also be made air tight and all joints and connections should be well fitted, caulked and riveted. Use asbestos gaskets on clean-out doors.
15. Locate flue dampers in front of boiler so that fireman will adjust them as required. Dampers located in rear of boilers are seldom disturbed, regardless of condition.
16. The size of coal has much to do with capacity and efficiency of boilers. In general, the air pressure penetrates the fuel bed formed by coarse coal easier than that formed by finer coal, resulting in disturbance of best furnace conditions.

In addition to the above suggestions, the following "Don't fail to do" list should be followed:



Typical fire bed—stoker fed

Don't fail to—

- Keep the heating surfaces of the boilers free from soot, scale or oil.
- Keep the fires level and free from holes.
- Do not carry the fires so thin as to draw a lot of excess air through.
- Do not carry the fires so thick as to have incomplete combustion of the coal.
- Do not soak the coal with water before firing.
- Be sure the blow-off valves do not leak.
- Do not have the safety valve popping off continually.
- Cover steam pipes.

Do not waste steam through leaky valves or traps.

Never use live steam if exhaust steam is available and can be used as well.

An observance of the foregoing simple rules and suggestions should materially reduce the coal consumption of the average plant.

INSTALLATION OF DEAN VALVE CONTROLS

Motor-operating mechanisms have been applied to numerous water and steam valves, especially those of large size and where it was desirable to operate the valves from a distant point. However, only recently have they been used for purely industrial applications.

Electrical engineers of steel plants will be particularly interested in the accompanying illustration which shows two Dean Valve Controls on the delivery side of the blowers which supply air to the blast furnace of the Mark Manufacturing Company's new plate mill near Indiana Harbor, Indiana. The air for the blast furnace is supplied by two Ingersoll-Rand 5 stage turbo blowers rated at 4000 h.p. with a speed of 2250 to 2800 r.p.m. and an air delivery of 34,400 to 55,000 cubic feet per minute, at 14 pounds pressure. The air is taken in through two 72-inch intakes, the screened top of one of which may be seen in the illustration. The two discharge lines are 36-inches in diameter and lead from the blowers in the power house to the main discharge line just outside. There are two 36-inch gate valves located at the point where the 36-inch lines enter the 48-inch main discharge line.

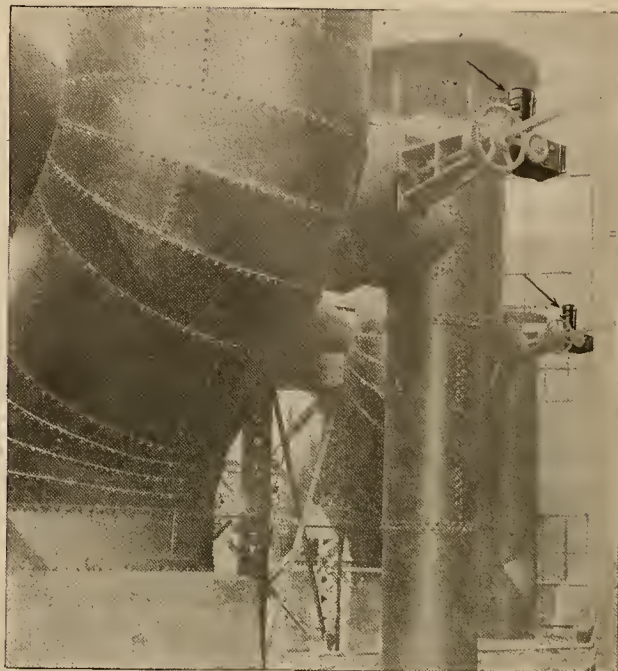
From the illustration it will be seen that the valves are placed approximately 15 feet above the ground, hence they would be very inaccessible to operate by hand, besides it would be very inconvenient to operate the steam throttle on the turbo blowers and valves simultaneously. At least two attendants would be required to close the throttle of the turbine and the gate valve at anywhere near the same time. In order, therefore, to make the operation of the valves convenient and to guard against any serious irregularities of the air flow to the blast furnace, two Dean Valve Controls were installed in the two 36-inch discharge lines with the valve control stations located near the turbine throttles. With this equipment the engineer can start the turbine and then, by merely placing the handle of the valve control station in the open position, open the corresponding discharge valve. This convenient and speedy control is especially desirable when changing from one turbine to another. The importance of being able to open and close these two valves very rapidly will be appreciated when one remembers that blast furnaces are very seldom shut down, while it is often necessary or desirable to shut down a turbo-blower.

The Dean Valve Control is made by The Cutler-Hammer Company of Milwaukee and New York. Primarily, it consists of a high torque squirrel cage motor, limit switches with special gear arrangement and one or more control stations.

The Dean System is entirely electrical in operation, using a fully enclosed motor as the source of power. This motor runs at a speed of about 1600 revolutions per minute and is connected to a system of combined worm and planetary gearing for the purpose of speed reduction to the valve stem. The gearing is enclosed in an oil-tight casing and the limit mechanism is included in a space above the gearing, the whole, together with the motor, forming a single unit with only four bolting down holes. All cables from the motor to the limit switch are encased in steel conduit and the unit is as impervious to moisture as it is possible to make it. The motor is easily removable from the casing and can be changed in a few minutes.

The weak feature of most electrical valve controls is the inability to securely seat the gate under all conditions, caused by the motor circuit being interrupted before the limit

of travel is reached and the gate being allowed to drift into its seat. This drift is a most uncertain quantity and it is dependent on friction of the moving parts. The Dean System drives the valve gate directly into the seat, under power, and to the exact point of tight closing, after which the trip mechanism releases the motor and gears from the valve stem, thus entirely eliminating over-travel, due to momentum of



An installation of a motor operated and remote controlled valve in a plate mill

moving parts. It is this momentum that is the cause of jamming the gate.

Control of the valves is secured by small control stations, placed in heavy cast iron boxes suitable for attaching to a wall or floor standard, and as many points of control as is desired, for one valve, may be obtained, at any distance from the valve. Each station is fitted with indicating lights showing the position of the gate.

The application of the Dean System to an existing standard gate valve is accomplished by furnishing a new yoke and a pair of driving gears and may be installed without putting the valve out of service. It is particularly adaptable to valves of the outside screw and yoke type since pads for the support of the unit may be welded onto the existing yoke.

MISCELLANEOUS BULLETINS

The National Motor Truck Committee of the National Automobile Chamber of Commerce, New York, has issued pamphlets urging the initiation of Rural Motor Express Lines throughout the country to alleviate the congestion on the railroad lines. The patriotic duty of helping get food from our farms to our allies is the keynote of the literature. Copies will be furnished to all applicants by the committee.

The University of Chicago Press has prepared a catalogue of books, pamphlets and journals published at the University for the academic year 1918-19. They are classified as Single Titles, Serials, Agency Lists and Journals, and the catalogue is indexed by titles and by authors.

The Department of the Interior has published No. 3 of the series of lists of Engineering Articles. The list is reprinted from the fifteenth and sixteenth annual reports of the United States Reclamation Service, for the information of engineers and others interested in the work.

BOOKS AND BULLETINS

Prevention of Rusting

"The Prevention of Rusting or Corrosion of Iron and Steel" is the title of an attractive booklet recently published by the Dearborn Chemical Company of Chicago. The pamphlet describes at length the list of specialties which the company is at present putting on the market.

Cutler-Hammer Pamphlet

"Miscellaneous Applications of Electrical Heat by Means of Standardized Units" is the title of a new four-page descriptive pamphlet being distributed by The Cutler-Hammer Manufacturing Company of Milwaukee. These standardized heating units are known as C-H Space Heaters. They are about the same size as two feet of lath. The blueprint which accompanies the new pamphlet gives all the dimensions of these standardized units. The pamphlet makes special mention of the great variety of applications of these units, important among which are: Crane and hoist cabs, meter houses, watchman houses, detached or exposed rooms, storage house offices, freight house offices, temporary construction offices, valve houses, sprinkler riser houses, mines, where explosives are present, where open flame would be dangerous, for keeping oils free to flow, drying rewound motor armatures, for table men and shear men in steel plants, for keeping automobile and motor truck engines warm.

Loss of Head in Small Valves

As a part of the experimental work conducted in the Hydraulic Laboratory of the University of Illinois a number of problems have been investigated. The results of four such problems have been published by the Engineering Experiment Station of the University of Illinois as Bulletin 105.

Part I of the bulletin, "Loss of Hydraulic Head in Small Valves," by Professor Arthur N. Talbot and Fred B. Seely, presents the results of experiments on the flow of water through 1-in. and 2-in. gate valves, 1-in. and 2-in. globe valves and 1-in. and 2-in. angle valves. Part II, by Professor Fred B. Seely, presents the results of experiments on submerged sharp-edged orifices of various shapes and sizes discharging under moderately low and under very low heads. Part III, "Fire Streams from Small Hose and Nozzles," by Professor Virgil R. Fleming, presents the results of experiments on 1½-in. hose and nozzles, both rubber-lined and unlined linen hose being used. Part IV, by Professor Melvin L. Enger, describes the orifice bucket as a means of measuring water and presents experimental data to indicate that the device is reliable for use in engineering practice.

Inspected Electrical Appliances

The National Board of Fire Underwriters sends out a supplemental list of inspected electrical appliances to complete the list of April, 1918.

Return Post Card

A return post card sent out by the Benjamin Electric Manufacturing Company points out the possible use of the little colored posterettes which the company is prepared to furnish for sticking on bills and letters, on packages and in windows.

Space and Speed in Steel Buildings

The Milliken Brothers Manufacturing Company, Inc., Woolworth Building, New York, has just published a new illustrated book entitled "Space and Speed in Steel Buildings," giving a description of the "Standardized Truss System" of building construction, designed and manufactured by the company. This system of erection is suitable for all classes of industrial and manufacturing buildings, making use of a simple, common structural steel unit, both for columns and trusses. No plans are necessary, and the buildings

are either permanent or portable. The system makes possible low transportation and erection costs. The book shows a number of interesting halftones, illustrating different buildings of this type constructed for the United States Government.

Simplex System

The Simplex Surface Contact Company, of Williamsport, Penn., has issued an attractive bulletin on the Simplex System as applied to the electrification of railways and cranes. The booklet is profusely illustrated and includes an inquiry sheet for the convenience of those wishing further information.

Vul-Cot Fibre

Two catalogs on Vul-Cot Fibre, one of general application and the other covering special parts for electrical, mechanical, automobile and railroad uses, have recently been issued by the American Vulcanized Fibre Company of Wilmington, Delaware.

Starting Switch for A.C. Squirrel Cage Motors

A novel two-page two-color envelope folder which illustrates and enumerates the advantages of the C-H 91-16 Starting Switch for A.C. Squirrel Cage Motors, is being distributed by The Cutler-Hammer Manufacturing Company of Milwaukee. This enclosed motor starting switch, which has been previously illustrated and described in the pages of the Journal of Electricity, has a steel case which entirely encloses the mechanism and fuses with only the operating handle extending through and is so constructed that the operator cannot come in contact with any live parts. The switch is automatically locked in the open position when the fuses are exposed and the fuses are made dead. These starting switches may be operated by an unskilled worker, either man or woman, and safety stop buttons may be placed at various locations so that in case of a dangerous machine the operator or others may push one of these buttons and bring the machine to rest, should an accident occur. The folder gives all necessary dimensions for installation and the ratings for use with standard as well as high torque motors.

Quality of Gas and Gas Lamp Efficiency

A new publication of the Bureau of Standards, Technological Paper 110, is entitled "The Influence of Quality of Gas and Other Factors upon the Efficiency of Gas Mantle Lamps." This paper discusses the various conditions such as gas quality, gas pressure, gas adjustment and air adjustment, which affect the operation of mantle lamps, and describes the methods and apparatus employed to control these variables and study their separate effects. The results obtained are given and their application to practical operation is touched upon. The work of other investigators upon various phases of the same problem is briefly summarized.

A Year Book

The Western Electric Company has not allowed these unusual war times to interfere with its established practice of putting out its annual catalog. This 1919 Year Book is more complete than previous editions, and in addition to the listing of electrical supplies and equipment it contains 24 pages of tables and useful information.

Bureau of Standards Papers

"Electrical Oscillations in Antennas and Inductance Coils" is the subject of paper No. 326 of the Bureau of Standards of which John M. Miller, Associate Physicist, is the author. The object of the paper in general is to apply the theory of circuits having uniformly distributed electrical characteristics to antennas—and point out the resultant effects.

Change of Prices

Announcement of a change of prices which has been in effect since Nov. 5th in response to rapidly mounting manufacturing costs is made by the Edison Electric Appliance Company in a letter accompanying a new price list.

NEW ELECTRICAL DEVELOPMENTS

(Various activities formerly held up by the War Industries Board are now being carried out in the Intermountain District. In the Pacific Central region the interconnection between Kennett and Castella is being completed and a new power project is being carried out on the Pit River. In the Northwest the municipal ownership of street railways is pending in several of the larger cities.—The Editor.)

THE PACIFIC NORTHWEST

STAYTON, ORE.—The Stayton Electric Light Company has recently sustained a loss from fire.

SPOKANE, WASH.—The Salmon River Power & Light Company has decreased its capital stock to \$50,000.

TACOMA, WASH.—Final steps in the investigation of the Lake Cushman power site are being taken by the city of Tacoma.

SPOKANE, WASH.—Universal Electric Company has been organized here with a capital stock of \$10,000 by G. W. Crowder, A. E. Russell, et al.

TACOMA, WASH.—Manager Louis H. Bean of the Tacoma Railway & Power Company states that he will have ready, in about three weeks, a proposition to sell the entire street car system of Tacoma to the city.

MONTESANO, WASH.—The Northwest Electric & Waterworks is moving one unit of its power plant to the Red Mill where it is equipping a plant to insure Montesano sufficient power and light at all times and in all seasons.

SEATTLE, WASH.—The Capital Issues Committee has approved an issue of utility bonds amounting to \$350,000 for completion of the loop of the municipal line at the Seattle North Pacific Shipyard and \$200,000 East Marginal Way street railway bonds.

CLEAR LAKE, WASH.—Electrification of the sawmill of the Clear Lake Lumber Company at Clear Lake, Washington, is almost finished. The Allis-Chalmers Manufacturing Company installed the 1000 kilowatt steam turbine and made complete electrification of the mill.

SEATTLE, WASH.—An amended franchise has been granted the Chicago, Milwaukee & St. Paul Railway Company for the construction, maintenance and operation of an electrical power transmission pole line along certain county roads, streets and avenues in King county.

EVERETT, WASH.—The construction of two additional Soya bean tanks at the site of the Seattle-Everett Dock & Warehouse Company is one of the first steps towards increased wharf facilities at Everett. The commercial associations are enthusiastically backing the undertaking.

SEATTLE, WASH.—Plans have been completed by the engineers of the Puget Sound Traction Light & Power Company for a one-story concrete building at the Jefferson street substation to be used for housing lightning arresters. Roof and floor will be of concrete. Day labor will be employed.

PILOT ROCK, ORE.—The water and light system is being discussed here and the attorney for the city has been authorized to cover the water, light and power proposition. An election will be called for the purpose of bonding the city to raise funds for repairing the water system and for taking over the light business.

ONTARIO, ORE.—Notice has been given by the directors of the Payette-Oregon Slope irrigation district of an election to be held on the 30th of December for the purpose of determining whether 6% bonds of the district in the amount of \$50,000 shall be issued to meet the deficit in maintenance for the year 1918, and to provide funds for the purchase of a new pumping unit to supplement the existing pumping machinery of the district.

SEATTLE, WASH.—The city authorities of Seattle and the Puget Sound Traction Light & Power Company are still

negotiating on the point as to whether or not the principal and interest of the bonds as they fall due shall be a charge on the gross receipts of the street railway, or rather the revenues of the railway. The company is contending for the idea of their being a charge against the revenues. The sale of the lines to the company is therefore hanging fire.

SEATTLE, WASH.—Corporate name of Westerman Iron Works, Seattle, has been changed to the Bacon & Matheson Forge Company. The personnel of the stockholders, trustees and officers of the corporation remains the same. The officers are Cecil H. Bacon, president, W. Scott Matheson, vice-president and A. J. Carmody, secretary. It is the intention to install about \$50,000 worth of new equipment, changing from steam to electric power. The new equipment will include an electric crane.

SEATTLE, WASH.—Operation of steam trains to the Seattle shipyards district will be discontinued on February 1, 1919, at which time the municipal elevated line will be completed, and there are 25 new cars in the municipal yards ready for service. It is expected that the city's purchase of the lines of the Puget Sound Traction Light & Power Company will be completed by that time and that the unification of the traction and present municipal lines will facilitate handling the shipyard traffic.

SEATTLE, WASH.—An official call for bids has been issued by the Port of Seattle Commission for furnishing a large Gantry electrically operated traveling crane for use on Pier "B" at Smith's Cover terminals, the new 2500 ft. pier soon to be erected by the Port of Seattle. The crane as specified by the chief engineer will cost approximately \$90,500. Its capacity will be about 25,000 pounds for a 20-foot radius and 5000 pounds for the maximum 51 ft. radius. It will be of the locomotive type.

PILOT ROCK, ORE.—An open meeting of the council in which the Commercial Association and citizens in general participated was held here recently, at which time the water and light situation was thoroughly discussed. On motion, the ordinance recently drawn up covering the water question only, was rejected and Attorney Schannop was ordered to draft another ordinance that would cover the water, light and power proposition. This will be done immediately and an election called for the purpose of bonding the city to raise funds to repair the water system and take over the light business.

SPOKANE, WASH.—An investigation of the street car situation in Spokane and possible public ownership of the two traction companies is recommended in a communication made to the city council recently by Commissioner Leonard Funk. The council at Funk's suggestion requested Mayor C. M. Fasset and Corporation Counsel Geraghty to conduct an investigation and survey of the traction situation and to make any recommendations they think proper. Seven-cent street car fares, immediate betterment of service and a consolidation of the two lines are suggested by Funk and other commissioners as matters that should be investigated and placed before the people.

SEATTLE, WASH.—Councilman Oliver T. Erickson introduced a resolution in the city council authorizing the mayor, corporation counsel and chairman of the finance committee to ask for approval of a \$750,000 bond issue for exten-

sions to light and power plants. The resolution specifies that the money is needed as follows: \$40,000 for motor generator on elevated line, \$30,000 for Ballard extension, \$50,000 for switches, \$200,000 for Cedar river sealing operations, \$75,000 for interconnection of city power lines with Puget Sound Traction Light & Power Company's system, \$120,000 for substation, \$125,000 for pipe lines and \$105,000 for general construction work. The resolution was referred to utilities and finance committee.

THE PACIFIC CENTRAL DISTRICT

PALO ALTO, CAL.—The Board of Public Works authorized the city engineer to proceed with the work of installing street lights in South Palo Alto.

DELANO, CAL.—R. S. Freels has purchased the electrical stock owned by Harry Young and will open an electrical shop in the building formerly occupied by the Delano Record.

REDDING, CAL.—Fifty men are now engaged in construction work in the Happy Valley irrigation district. It is estimated that \$100,000 will be spent during the coming year for new work.

SACRAMENTO, CAL.—The city has rejected all bids for the construction of the proposed electrically-operated pumping station at the municipal waterworks plant. It is understood that new bids will be asked at an early date.

BROWNS VALLEY, CAL.—Steps toward a larger irrigated acreage and a preliminary survey by Government engineers to determine methods for the extension of the Browns Valley irrigation district were taken at an enthusiastic meeting held here.

HAPPY CAMP, CAL.—Mason Valley Mines Company is considering plans for the construction of a new concentrating plant at its Gray Eagle copper mines, in Siskiyou county. Considerable electrical equipment will be required in this connection.

SAN FRANCISCO, CAL.—The board of trustees of the Northwestern Electric Company has declared a quarterly dividend of \$1.50 per share payable January 1, 1919, on preferred stock of record December 24, 1918. This is at the rate of 6 per cent per annum.

FRESNO, CAL.—The Kearny boulevard electrolier system—the longest lighting unit in the city—has been completed and turned over to the city. The new lighting system extends from the subway, out Fresno street to Kearney boulevard and thence to Tehama.

RICHMOND, CAL.—The Richmond division of Western States Gas & Electric Company has secured renewal of contracts with the Tilden Lumber Company for five years, the California Cap Company for three years and with the Turner Dahnken theater for five years.

SAN FRANCISCO, CAL.—Engineers Heller & Wilson, 57 Post street, report having finished plans for an irrigation project covering 500 acres in Yolo county. The same firm recently awarded contracts for a high pressure irrigation project for the Hill ranch at Bixler, Contra Costa county.

YUBA CITY, CAL.—The Chamber of Commerce is discussing plans for the construction of a reservoir in Sutter Buttes, where it is proposed to occupy 100 acres. It is to be 100 feet deep and it is believed that the reservoir, when constructed, will irrigate 1000 acres of fertile land on the lower levels.

SACRAMENTO, CAL.—The city electrical department has placed two red globes in each group of electroliers on J and K streets from the Southern Pacific station to Sixteenth street, and also on the side streets from the alleys I and J and K and L, making two rows of red lights, one on the street side and one on the side next to the buildings.

SAN FRANCISCO, CAL.—The supervisors have authorized the Board of Public Works to prepare plans and specifications and to enter into a contract for the recon-

struction of railroad tracks on a portion of Taravel street, and for the construction on Brighton street between Ocean and Grafton avenues.

RED BLUFF, CAL.—The city trustees have passed the necessary resolutions for the installation of a street lighting system and have employed E. A. Rolinson of Redding to prepare plans and specifications. Material and equipment for such a system will be acquired, as negotiations for its purchase have already begun.

WILLOWS, CAL.—Resolutions were adopted by the Irrigation Districts Association of California, meeting here, recommended use of state credit for building and operating for the first few years, large irrigation projects to build power plants and sell electric power, and take steps to aid returned soldiers and sailors to settle upon the land.

ROSEVILLE, CAL.—The city trustees have fixed a minimum rate for electric current furnished for light, power and fuel, at 50 cents per month. All energy furnished by the city is under the meter plan. In many cases the amount used has not exceeded 30 cents per month, which is less than the cost of the service. The new rule takes effect January 1st, 1919.

OROVILLE, CAL.—Representatives of the Western Canal Company are investigating the feasibility of irrigating a tract of 25,000 acres lying above the canal. This includes a portion of South Thermalito and land east of Tres Vias. It is stated that this land can be irrigated by a comparatively light pumping lift. Experiments will be made in the growing of cotton on a commercial scale.

CHICO, CAL.—The irrigation system now under construction at Phelan ranch, which at first was projected to irrigate that ranch only, has been added to until it will be flexible enough to care for several thousand additional acres. Part of the water will be diverted onto the Parrott Grant. The system will call for the expenditure of approximately \$125,000 and will be completed by March 1, 1919.

SAN FRANCISCO, CAL.—Funds for the construction of the Hetch Hetchy water and power project were assured to San Francisco when the Board of Supervisors accepted a bid of the Anglo-London Paris National Bank for \$1,000,000 worth of the bonds at earliest maturity and gave an option on the remaining \$8,051,000 serial bonds and \$254,000 school 4½ per cent bonds, now in the hands of the city and county treasurer with authorization for sale.

OAKLAND, CAL.—Oakland won its year-old fight against the Great Western Power Company recently when Judge Everett J. Brown gave a decision awarding the city \$69,000. The suit was over the question as to whether the company is operating under the 1913 franchise, which provides a rate of tax on three products. The decision sustained the city's contention in regard to heat and power, regarded as byproducts, but sustained the company's contention with regard to light.

REDDING, CAL.—The California-Oregon Power Company has almost completed its power line extension from Castella to Kennett. The heavy copper wires or cables are in place, and telephone wires are being strung. It is announced that power will be delivered to the Kennett smelter soon. The Mammoth Copper Company is the largest consumer of the Northern California Power Company. The power now going there will be delivered to the Pacific Gas and Electric Company for the San Francisco Bay district consumption.

SAN FRANCISCO, CAL.—The final account of John P. Coghlan, receiver of the Northern Electric Railway system, was settled recently by Federal Judge Dooling and Coghlan was ordered discharged as receiver. The account of the receiver showed that under his management the railway was thoroughly overhauled and repaired, and approximately \$500,000 was put into betterments and extensions, with the result that the earnings of the system increased under the receivership more than \$200,000 a year.

SUISUN, CAL.—Final arrangements for the electrification of the Rio Vista bridge, which includes the motors, generators and gears, has arrived and is being installed this week. The Great Western Power Company will erect a substation near the Rio Vista entrance to the bridge. Aside from the power supplied by the Great Western, the Pacific Gas & Electric Company will run a secondary line to the structure. Work on a joint pole line to be erected by both companies from Rio Vista to the bridge, will be started at once.

COPPER CITY, CAL.—A survey for a dam 200 feet high across Pit river, three miles beyond here, has been completed. The surveyors are located at Judge Ralston's place, 12 miles of the river, where the second dam is to be built. The unfolding of this scheme reveals plans for one of the largest electric generating plants on the Pacific Coast. It is said the power houses will be built at the first dam, and that the power will be used for the electrification of the Southern Pacific Railroad Company from Redding to Ashland, Oregon.

SAN FRANCISCO, CAL.—The Republic of China has contracted with the Marconi Wireless Telephone and Telegraph Company for the installation of 200 wireless telephone systems throughout the empire, according to E. R. Morse of the Marconi Company, who was here en route to China to superintend the installation and to conduct the service. Each of these wireless telephones will have a capacity of transmission for forty miles, Morse said. "The contract calls for the expenditure of \$4,000,000, which is guaranteed by the Chinese treasury and which is repayable to the company by the year 1929. A number of American, French, British and Italian experts are now on their way to China to operate the system and to train Chinese operators."

THE PACIFIC SOUTHWEST

LONG BEACH, CAL.—An appropriation of \$1800 was made by the City Council for installing lights near the harbor jetties for the benefit of local and transient mariners.

LOS ANGELES, CAL.—Plans have been prepared by Pacific Electric Railway Company for the erection of a substation, 30 ft. by 50 ft., at Maple Avenue and Seventh Street.

GLENDALE, CAL.—The Southern California Edison Company has applied to the State Railroad Commission for permission to sell part of its local system to the city of Glendale.

SAN PEDRO, CAL.—Southwestern Shipbuilding Company has had plans prepared for the construction of a new brick, steel and concrete transformer house at its works at East San Pedro.

LOS ANGELES, CAL.—The Railroad Commission has granted the Southern California Edison Company authority to issue at par \$626,500 six per cent notes for refunding or renewing notes held by Southern California banks.

LOS ANGELES, CAL.—Pacific Electric Railway Company, Pacific Electric Building, has had plans prepared for the construction of a one-story brick and concrete substation, about 35 by 50 ft., to be located at Seventh street and Myrtle Avenue.

LOS ANGELES, CAL.—October earnings of the Southern California Edison Company were unfavorably affected by the influenza epidemic, which closed down many public gathering places that were supplied with power and light by the corporation.

SAN PEDRO, CAL.—Chief Electrical Engineer E. F. Scattergood recommends that the city purchase the distributing lines of the Southern California Edison Company, now serving the Municipal Pier No. 1, Smith Island and Fish Harbor in the harbor district.

SANTA ANNA, CAL.—The Southern Counties Gas Company has made plans to enlarge its plant on East First Street. Improvements to the amount of \$7500 will be made

including the new equipment. New construction work and alterations are estimated at \$5000. Work will be started this week by Contractor J. S. Fluor.

SAN DIEGO, CAL.—Blythe, Witter & Company have just purchased an issue of \$483,000 six per cent debenture, gold bonds, of the San Diego Consolidated Gas & Electric Company, authorized by the Railroad Commission and approved by the Capital Issues Committee, and will offer the bonds to investors within the next few days.

LOS ANGELES, CAL.—In connection with the proposed construction of power plant No. 2 in the San Francisquito canyon, preliminary plans have been prepared for the installation of the steel pipe line and penstock, estimated to cost in the neighborhood of \$75,000. The Power Bureau of the Department of Public Service is in charge of the work.

THE INTER-MOUNTAIN DISTRICT

RENO, NEV.—The Squaw Valley Dam in western Elko county, one of the largest reservoirs in the State and the source of irrigation of over 1200 acres of alfalfa land, is to be raised 20 feet above its present height of 55 feet. The improvement will increase the capacity of the dam to 24,000 acre feet of water.

PUEBLO, COLO.—The Arkansas Valley Railway Light & Power Company will benefit through increased power business due to the Government lifting restrictions on fuel to cement plants. It is expected that the mill at Concrete will resume operations during the week.

GREAT FALLS, MONT.—Word has been received from Washington notifying Senator Walsh that the War Industries Board has reversed its ruling and sanctions the expenditure of \$800,000 in the construction of a flour mill by J. F. Blecker, Ira Goodman and Charles Lewis at Broadus.

SALT LAKE CITY, UTAH.—B. Marcus Priteca, architect, Seattle, Wash., who has prepared plans for a ten-story theater and office building of fireproof construction at Salt Lake City, is asking for bids for the electric wiring and lighting fixtures, as well as for plumbing, heating and decorative plastering. This structure is for the Pantages circuit, headed by Alexander Pantages, Seattle. It is probable that other theaters of this class will be designed by Mr. Priteca for California.

BOISE, IDA.—A bond election was held in Camas recently when irrigation bonds in the sum of \$675,000 to construct the irrigation works of the Camas Mutual Irrigation District were carried without a dissenting vote. The construction work on the reservoir and canal system will be begun as early in the spring as weather conditions will permit and rushed to completion as rapidly as possible.

OGDEN, UTAH.—An added area, including 40,000 acres of land, will be given to the state for agricultural purposes by the building of the irrigation project contemplated in the Uinta Basin, it is claimed, according to two applications filed with State Engineer Geo. F. McGonigle by the Uinta Irrigation & Power Company. The first application asks for 108 cubic feet per second of water from Ashley Creek and Dry Fork in Uinta County, and the area to be irrigated is 20,000 acres. It is also asked that a main canal 42,860 feet long, 24 feet wide at the top and 12 feet wide at the body with necessary laterals be constructed. The second application is for 320 acre feet of water to be taken from Ashley Creek in Uinta County to be used for irrigating an additional 20,000 acres.

POCATELLO, IDA.—The Public Utilities Commission of the state of Idaho has granted a flat increase in rates per thousand feet of gas to the Pocatello Gas & Power Company to meet increased costs of operation.

PETERSBURG, COLO.—The power house of the National Alfalfa Products Company was recently destroyed by fire.

THE VACUUM CLEANER

THE VACUUM CLEANER

SMALL CHANGE is not of much service to pay the monthly household bills, but it comes in very handy for casual expenditures. Likewise the incidents of the day and casual happenings which form no basis for serious composition are nevertheless the exchange medium of conversation. In order to preserve some of these items which are passed along from hand to hand and are so likely to find themselves eventually in the waste basket, the Office Vacuum Cleaner is here permitted to pick over its own acquisitions and present them for your interest.—The Editor.



Once more the poet touches his lyre. This is intended as no aspersion on the characters of either



E. M. Cutting, of the Edison Storage Battery Company, who wrote the poem, or H. E. Sanderson, of the Bryant Electric Company, its subject. The facts of the case are that "Sandy" as noted served most successfully as toastmaster at the recent convention of the Electrical Supply Jobbers at Del Monte and that "Uncle Ed" celebrated his achievements in song at the Christmas luncheon gathering of the San Francisco Development League on Dec. 16th. The picture is frankly a libel. (The verses should be sung to the familiar "In the Gloaming." Now, all together!)

STILL-A-MOANING

In that evening, oh, my "Sandy"! When the lights were all so bright, With your shoe-tree gavel handy, Softly tapping with your right, When the gang went wild with singing And were howling unknown woe, And you made us call you "Mister" You were surely not so slow.

Mister San-der-son, we love you! Love you for the wit you are! As a roasting Toasting Master, All the rest, you skin by far, For you, all our hearts are longing, What you are, you'll always be. It were best to leave you thus, dear, Best for us, and best for thee.

It were best to leave you thus, Best for us, and best for thee.

Poetry is not confined to the electrical industry, according to this tale told by one of the house papers which come into this office—it is at least quoted by the gas men. It seems that in a western town the attorney for the gas company was making a popular address.

"Think of the good the gas company has done," he cried. "If I were permitted a pun I would say, in the words of the poet, 'Honor the Light Brigade!'" Whereupon a shrill voice came from the rear: "Oh, what a charge they made!"

The origin of the word doughboy is familiar to most Americans through the explanation furnished by the Stars and Stripes, which refers the word to the shiny round buttons worn on former uniforms and resembling the boiled dumplings of sailor fare. An English explanation is brought us by Capt. R. W. A. Brewer whose work in connection with the Moorhead Laboratories is mentioned elsewhere in this issue. "The Tank," a publication issued by the members of the British War Mission in the U. S. A., suggests that the name goes back to our Mexican War in 1846 when the American soldiers occupied the deserted Mexican "adobes" which in time became "doughboys."

A still more English explanation is that it dates back to the olden days when the English foot troops wore white belts on parade and to keep them white used pipe clay, which, when it was rained on, formed a sort of dough-like substance. Hence the title.

The presence in America of the English officers and men who are back of this little paper has done much to cement the friendship of the two nations—and it is to be hoped that we will have them with us for some time still in the future.

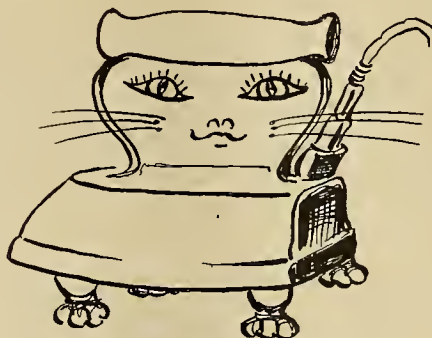
Deadmen tell no tales, but here's one that has a tale, nevertheless, as reported by A. E. Chandler. Mr. Chandler is president of the California State Water Commission and those familiar with his writings in the columns of the Journal of Electricity will recognize that the verse is not of his own composition. It was found on a board at the head of a mound over the deadman of a cable across the Klamath River at Requa, Del Norte County, California. At first glance the mound appears to be a grave and the board a headstone.

This deadman found in the sod
Tho't I'd send his spirit to God
So buried him by the River side
Where nothing bothers him but the tide.

This deadman holds this wire
So don't call him a liar
Like him a very good man
Always do the best you can.

When the tide comes and the wind
Sure shot the Ferryman Sined
And we would travel up the river higher
Only for the deadman that holds this wire.
Amen.

A moral goes along with this smiling "beastie"—for special application to housewives and children. But then all electric appliances are blessed with good characters.



THE ELECTRIC IRON

A smiling iron smoothing out
Wrinkles as she sees them.
Folks can move her all about
She will always please them.
Children, we should mind our ways,
Never, never whining,
Being cheerful always pays—
Find the silver lining.

In This Issue: Possibilities for Electric Smelting in the West

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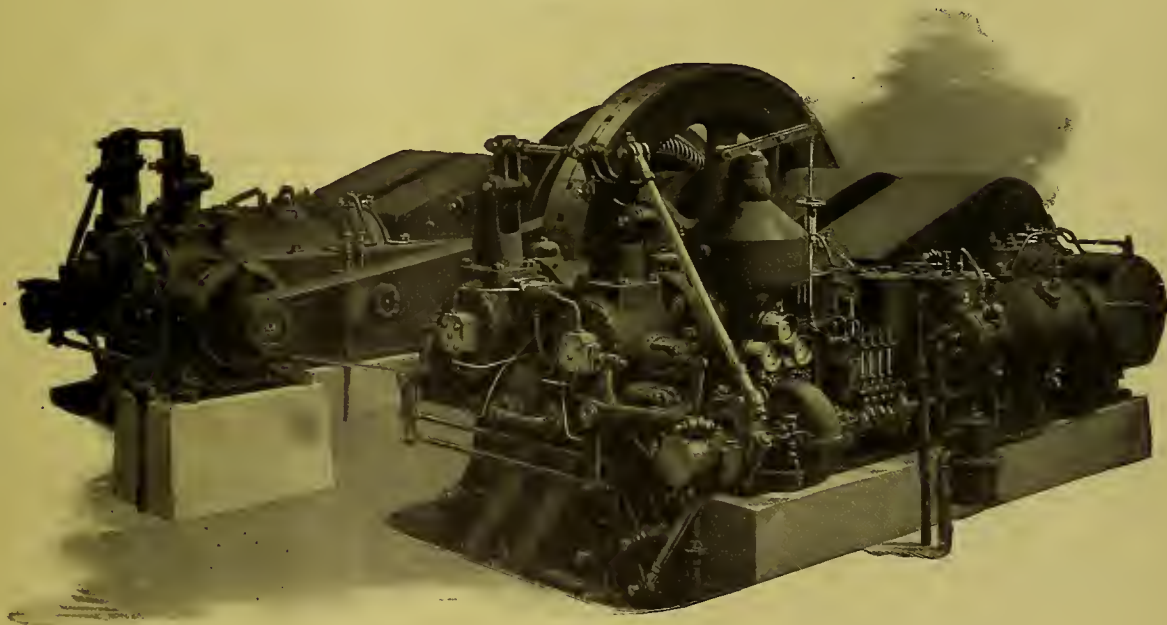
JOURNAL OF ELECTRICITY

VOL. 42 NO. 2

SAN FRANCISCO, JANUARY 15, 1919

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THE ALLIS-CHALMERS CRUDE OIL ENGINE DIESEL TYPE



Allis-Chalmers Twin Duplex Oil Engine direct connected to an Allis-Chalmers 60-Cycle Alternator

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WHEN THAT OVER-STRAIN DOES COME

It may not be till next year; or it may be next month, next week or tomorrow. Any moment, your Bus Bar Supports may have to meet the strain of a surge which will threaten the safety of the plant. For the maximum of safety, install

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The feature which is chiefly responsible for their superiority to previous types, is the replacement of clamped and cemented fittings by

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

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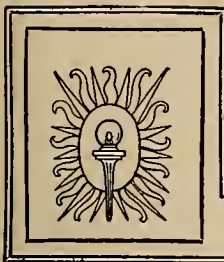
ROBERT SIBLEY
SECRETARY-TREASURER

ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER

HOW THE WEST TAKES A NEW LEAD IN CONSTRUCTIVE DEVELOPMENT —

THE world beating engineering records of the West, wherein twenty gigantic new feats, surpassing in magnitude and daring any of a similar nature elsewhere in the world, were forcefully dwelt upon in various issues of the Journal of Electricity during 1918. With this issue an account of a new lead in constructive development is set forth. Not in piercing mountain fastnesses with tunnels nor in stretching giant transmission lines across the desert is this feat concerned except in providing able and effective means whereby accurate and definite information may be readily found concerning facts and figures necessary in the business operation of a great industry. Nevertheless the Riverside Service Library, situated in a delightful and enchanting section of California, in initiating its unique and helpful course on the business library, under the able direction of a business librarian from one of our great engineering managerial companies, is to be congratulated on bringing into life a movement that is destined to grow from small beginnings into a sphere of usefulness, in full keeping with other great constructive ideals that have made the West so justly famous in material accomplishment and in providing means whereby facility and ease in execution may the better be attained.





JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, JANUARY 15, 1919

Number 2

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Theodore Roosevelt

public utterances of recent months, there are few of us who have not gathered from his life work a new sense of true Americanism—few that have not felt from it a quickened sense of public duty. And his dominating ideals of life—buoyant, virile, eternal in their activity—will live in the realities of life throughout all ages to bless and quicken the pulse of his fellow man in human relationship one with the other.

is gone from our material vision, but whether we be among his followers or in the ranks of those who bitterly opposed his actions, especially his

The great American shipbuilding contracts, amounting to nearly two hundred millions of dollars, that are now under way in Oriental ports, coupled with the proposed loan of fifty millions of dollars to China by the United States, Great Britain, France and Japan, which has been sanctioned by our State Department, will enable China to take an active part in the rehabilitation of her own economic situation and at the same time present a hand of helpfulness in the great problems of reconstruction that now face the world.

But to engineering and commerce in the West this move has unusual significance. It means that the growth of Pacific Coast States in industry and in power development will be rapid. Already the great banking houses of the nation are preparing to render increased banking facilities. As an instance of how financiers view these possibilities ahead, one great banking house of New York City—the Guaranty Trust Company—has through its subsidiary house, the Asia Banking Corporation, sent just recently fourteen banking experts to the Orient to open up closer relations. This corporation, realizing the tremendous prestige acquired by men of influence in the West, has added to its directorate and executive officers a number of well-known leaders in the electrical industry and in banking circles of the West. Among these may be mentioned Herbert Fleishhacker, president of the Anglo and London, Paris National Bank, San Francisco; M. F. Backus, president of the National Bank of Commerce, Seattle; C. F. Adams, vice-president of the First National Bank, Portland; Challen R. Parker, cashier of the Anglo and London, Paris National Bank, and Willis Booth, well-known in Western circles as chairman of the board of Edison Electric Appliance Company, Inc., to be vice-presidents of the Guaranty Trust Company with residence in New York City.

That such reorganizations as this, which is but typical of the confidence felt in the immediate future

for vast growth between the Pacific Coast States and the Orient, are occurring in increasing numbers in every line of commercial and engineering activity, portend a stability and surety for investment in industrial and engineering enterprises is beyond the question of a doubt.

There is a unique course in library service that is being put through in the enterprising city of Riverside, California, which will continue during the next several weeks. This service is of intense interest and of great practical importance to business men generally and to members of the electrical industry, as it comes in this day of research and readjustment, with peculiar emphasis.

To be thoroughly up to date and in accord with business practice that is each day advancing with a rapidity never before experienced in history, the business man finds quick and ready reference a matter of prime importance. He must himself accumulate information and file it in easily accessible manner and at the same time have within reach the splendid service of his company library and the library of the community in which he lives. How to collect this information and how to readily apply the information, when collected, are problems that prove vexing and often, if due care and method be not observed, prove disastrous.

The Journal of Electricity is fortunate in being able to announce that a series of some twelve short, snappy articles on this important subject will appear in early issues, covering just these salient features of library service that are so desirable to be known and understood by the business man. The author of the series is Miss Louise B. Krause, librarian for the H. M. Byllesby & Company of Chicago, a firm well known throughout the West for care and system in engineering and business practice. Miss Krause has been president of the Chicago Library Club and has lectured before a number of universities and

A Reason for Optimism in the West

Library Service for the Business Man

library associations. At the present time she is giving the library service course on the business library, setting forth its principles of organization, cost of maintenance and earning value to a business organization, at the Winter School of the Riverside Library Service School above referred to.

It is believed that readers of the Journal of Electricity—manufacturers, jobbers, commercial men, executives of utilities, contractor-dealers, and many other groupings—will find this series of unusual interest and profit in this day of readjustment and interdependence on progress and business methods in other organizations and communities.

Thoughtful observers see in the future an ever expanding field of usefulness for the electric truck.

The Electric Truck and the Highway

The marketing of farm products in the enterprising rural districts of the West is being vastly forwarded by the use of trucks. That the electric truck is destined to acquire a broader use in this growing field of activity is the conclusion of all those who are familiar with the favorable conditions offered for this type of traffic carrier, due to the excellent system of highways that prevails in this section of the country and especially to the growing facilities whereby electric current can be acquired for operating loads of this nature in practically any large agricultural area in the West.

The question now arises as to what general action the highway authorities should take in properly safeguarding the permanence of the highways by limiting the truck traffic conveyed over the highways so as to duly protect their structure and yet at the same time encourage this economic development of our rural traffic system which will unquestionably mean much for the utilization of our water power resources and its consequent saving in fuel, and yet at the same time serve so wonderfully in intensifying the economic marketing of the vast agricultural output of the West.

Many methods are being advocated whereby this traffic limitation may be numerically expressed. Much of the discussion seems to indicate an inclination to recommend maximum unit loads of 25,000 to 28,000 lbs. If such a law were passed, it would be very easy to interpret a truck and semi-trailer or a truck and train of trailers as a unit.

As pointed out by one prominent truck manufacturer, the future big use for motor trucks will be in inter-city transportation, and the bigger the load that the motor will draw, the more competition it will be to the railroads for short hauls,—say up to 300 or 400 miles. In order to compete with the railroads big loads must be handled and there is only one way to handle them and that is with trailers. Therefore, there is a possibility of getting laws made that will restrict development.

By the elimination of the maximum unit idea altogether and instead the passing of a law based upon maximum weight per tire inch, in which a distinction is made between driving wheels and wheels that do not have power applied to them, it would seem a more just and scientific appraisal of design could be arrived at.

The experience of one well-known manufacturer who has given a great deal of research attention to the matter indicates that a tire which is not subjected to tractive strain need not be more than half the width of a given weight of one which is subjected to tractive strain. Therefore, should a recommendation be made for a certain weight,—say 800 lbs. per tire inch, it would not be fair to the trailer user because he would have to have bigger tires on his trailer than necessary, which of course means unnecessary expense.

The entire matter, though as yet of little present importance to the electrical industry, has in store such rich possibilities for the future that it would seem well worthy the thought and study of electrical men throughout the West.

Data just compiled by the U. S. Geological Survey indicate most interesting results on copper

Copper Production in the West

production in the United States. In view of the vast electrical uses to which copper is put this production has unusual significance for the electrical industry.

The total production of copper for the several states, including Alaska, indicate a total of nearly two billion pounds of copper for 1918. Arizona comes first with a total production of over three-quarters of a billion pounds, Montana second with nearly a third of a billion, and Utah third with a quarter of a billion, while the once leading state in copper production—Michigan—ranks fourth with slightly under a quarter of a billion pounds.

It is certainly a significant fact that the states west of the Rocky Mountains, so prolific in power possibilities, should also be so prolific in copper, the one great metal used so extensively in the electrical industry. Of this great production of nearly two billion pounds of copper in 1918, the states west of the Rocky Mountains produced over eighty-five per cent.

The manner in which the whole world was convulsed when many of our preconceived prejudices

The Kind of Publicity Needed

against certain peoples and international actions were exposed to be nothing but the effect of an insidious German propaganda has led thoughtful men to view all published matter with a more critical eye than formerly.

And this brings us to a consideration of the best mode of procedure whereby the truth about the power situation may be the better placed before the public mind, and thus receive the earnest attention it so justly merits.

In order that such data may bear upon its face the stamp of sincerity and the force of conviction it is necessary that any proposed campaign of publicity should be undertaken with unusual care in compilation of facts and figures to be presented—such facts and figures as would indicate to the reader a breadth of view, visualized from what has transpired in world events of recent months with their indelible stamp of a wider humanitarian conception and outlook upon business affairs.

Those who have studied the utility problem and the power situation realize that only by the more open and above board treatment of the problem can action for betterment be brought about. Those who have these matters nearest at heart have formulated clear and unbiased convictions as to their proper treatment and know for a certainty that if only the public mind can see the problem as clearly as they, the conclusions of an unbiased public mind must be the same as theirs.

Hence the whole problem is one of education. No false step should be made in presenting half-baked ideas or data with cloudy or uncertain substantiality. To properly put forth an effective campaign of education or, if you will, a campaign of publicity, it must be realized from the start that the whole problem is deeper and broader than mere newspaper notoriety. It involves the crystallizing of public opinion in the matter of the development of the great water power resources of the West, and this molding of opinion can not be brought about unless the foundation work is laid upon the broadest lines possible.

To this end, not only should the data to be used be most carefully compiled but the channels through which the effort to reach the public are chosen should be most carefully considered, and every step taken should have the planning of a master mind that can analyze to the public in such a way that the public can grasp it.

And the public, when convinced that the whole matter presented is set forth in the spirit of open, fair education and not in the spirit of propaganda, will from the start give the matter the just consideration such broad effort must of its very weight command. Only by such a campaign of education can relief in the power situation be brought about.

The temperance wave that is gradually but steadily sweeping the country has led men of the West, who are familiar with the present gigantic investment in the grape growing industry in this section, to view with increasing concern the marketing of the product of the vine when the national prohibition amendment has become a binding enactment. This investment in California, for instance, is of such vast totals as to have become a vital factor in the fight as to whether the state become wet or dry in the future.

To the electrical industry, the saving of this product by the initiating of a new industry in which

electrical energy will undoubtedly play a leading part, the problem becomes one of unusual importance. Hence the preliminary report on the possibility of a grape syrup, investigated by two well-known authorities at the Agricultural Experiment Station of the University of California, comes now with unusual interest.

It appears from these preliminary investigations that about 250,000 tons of wine and table grapes cannot be used next year in the usual way. This represents a value of the raw material of over \$4,000,000. In the manufactured state, as wine and other alcoholic beverages, this value would be about twice the figure quoted. Such a loss as a consequence will be deeply felt by thousands of grape growers throughout the West.

If these grapes were made into grape syrup, experiments upon the manufacturing and marketing of which are proceeding with unusual promise, the product saved would be equivalent to over 40,000 tons of sugar of a present value of nearly \$8,000,000. The investigation above referred to has shown that a grape syrup can be made which is wholesome, attractive and suitable for table use, cooking, the making of jams and fruit butters, and for the canning of most of our fruits. Most of the equipment necessary for making this syrup already exists in the wineries and beet-sugar factories of the state and what is lacking could easily be obtained.

The marketing of this large quantity of a new product could, however, be successfully done only if many fruit canneries could be induced to use a certain quantity of grape syrup during the season of 1920. The entire matter deserves thoughtful consideration on all sides, and if certain governmental regulation is necessary the public generally should cheerfully back up any regulations that may develop as reasonable and proper to protect and assist in salvaging this great product.

The preliminary marketing of the syrup has already brought out interesting comments from sixty-five test purchasers. Sixty-six per cent expressed an opinion of very good, lovely, excellent, very nice, or good, with no unfavorable comment, while less than eight per cent found the product without merit.

The entire matter deserves the strongest support on the part of the public generally and the electrical industry, an industry serving so generously the agricultural districts of the West, is in position to give it unusually emphatic endorsement.

THE NEW JOURNAL SERVICE: The purpose of a very constructive article appearing in the February first issue of the Journal of Electricity, instead of this issue as previously announced, on Salvage of the Waste by H. N. Sessions, the commercial engineer of the Southern California Edison Company, will be to show that we are all more or less incapacitated by lack of thrift, and that part of the cure is salvage.

Electric arc-welding, by means of which the great German ships lying in American harbors were speedily repaired, when otherwise two years might have been necessary in their rehabilitation, is a subject of great interest and importance at the present period of reconstruction. A series of articles on this timely subject, profuse with test data and illustrations, written by one of our national authorities, Mr. F. A. Anderson, with the U. S. Shipping Board in San Francisco, will appear during February. Contractor-dealers have in store some unusually able educational helps that are being prepared by experts with the University of California Extension Division, full announcement of which will be made in later issues.

A BUSINESS LIBRARY COURSE

(A course in business library principles which is being planned by the Library of Riverside, California, to meet the need for training along these lines in the West. Special emphasis is to be laid on Public Utility problems and on the applications of library methods to office requirements. The instructor is herself Librarian of a public utility organization and particularly well grounded along these lines.—The Editor.)



The library class of 1918 taken on the steps of the Riverside Library itself

The course in business libraries which is planned by the Riverside Library Service School at Riverside, California, for four weeks during the month of February, is of considerable interest to public utilities and engineering organizations which maintain libraries of their own. This course is designed to train students for business library positions and also to be of practical assistance to librarians already doing business library work.

Library training is a good preparation for office filing and indexing and for the organization of quick reference material in busy places. The Federal Government and the business world have recruited hundreds of workers from libraries this past year.

The course as planned covers such subjects as: Principles of organization of the library, cost of maintenance and earning value to a business organization; how to collect information and how to apply it to business problems, illustrated by studies of differing types of business libraries (Financial, Indus-

trial, Engineering, Utilities, etc.); Methods of work and mechanical equipment; the application of standardized library methods (classification, cataloging, etc.) to business library files and the equipment and tools required. Reference books and reference problems in business libraries.

The course is to be given by Miss Louise B. Krause who is librarian with H. M. Byllesby & Company, Chicago. Miss Krause has had extensive practical experience in the organization and management of general and business libraries and has given several courses in her special subject before the University of Chicago, the Tulane University of Louisiana and elsewhere. She has been at the head of the Byllesby library since 1909 and has built up a department which has a national reputation for high grade efficiency.

The exact date of the course is not yet fixed, but it will either begin on Jan. 20th, according to the original plan, or two weeks later on Feb. 3rd.

DOES THE BUSINESS LIBRARY PAY?

BY LOUISE B. KRAUSE

Does it pay to have all the valuable information, printed or manuscript, pertaining to your business, collected, properly filed and indexed, and immediately available for use, when you want information on a busy day when every minute counts?

A man need not necessarily be in his office to ask his questions. One firm having a lawsuit in a city distant from the home office, wired for the prices of lead in the past twenty years. The librarian had the answer ready in ten minutes.

An engineer received a message saying a submarine electric cable which connected two towns on either side of a bay on the Pacific Coast had been damaged. He asked his librarian to tell him the depth of the water in the bay and how shallow it was near shore. The exact data were given him from a government publication.

A bond house asked his librarian to tell them what public utility companies in towns having about the same population as Blankville, and doing the same kind of utility business, had an equally large capitalization per capita. The librarian reported that the comparison showed that the capitalization of the Utility of Blankville was not too large per capita.

A natural gas man asked in a great hurry for the natural gas cases decided by Public Utility Commissions in which "going value" had been allowed as high as 10%. It took the librarian ten minutes to give him all the cases he needed.

A busy official studying on the necessity of increases in street car fares to meet expenses, asked his librarian to give him a list of all the towns in a certain state which had recently increased fares. The librarian had the data all ready for his use.

Does it pay to save the time and energy of the valuable man higher up, by having some one in charge of information, who knows how to forecast his needs and who has the material ready to be used without delay? If so, it pays to train workers to do Business Library Work.



Where the business library course is held

EXPERIMENTS IN ELECTRICAL STIMULATION OF CROPS

(Considerable interest has been shown in this country in the possibilities of stimulating crops by electricity. Most of the practical experiments along that line, however, have been carried out in England. An account of the latest of these tests is given here.—The Editor.)

During 1917 an area of an acre in Calderstones Park, Liverpool, was divided up into plots and sown with wheat, barley, and a number of vegetables, while near by but not near enough to be influenced by the treatment, a similar area was planted with the same crops and given the same amount of patent manure. Especial care was taken that the two areas should be as nearly identical as possible in soil, exposure, and other natural conditions.

The general method of applying the electrical treatment consisted of the use of a series of fine wires suspended from poles on either side of the electrified area. Much care was given to the insulation, which was triple in character, consisting, in the case of the principal insulators, of long glass rods to the ends of which the live wires were attached. A high-tension current was discharged through the air to the plants, and thence to the soil below. The supply of electricity was obtained from the ordinary city mains and then transformed into a high-tension current.

The crops were sown between May 24 and June 6, 1917, and were "lifted" between October 19 and December 5, according as they matured.

The following table gives a digest of the results of the experiment expressed in percentages of in-

crease or decrease in weight which the electrically-treated crops showed in comparison with those which were not so treated:

Crops.	Increase (+) or decrease (-). Per cent.	Crops.	Increase (+) or decrease (-). Per cent.
Beet root	+390	Cabbage	+25
Onions	+633	Potatoes:	
Peas (late)	+29	Great Scot	-13
Carrots (intermediate)	+29	King Edward	+2
Kohl-rabi	+3	British Queen	+63
Sugar beet	+467	Barley	+30
Mangolds	+219	Barley straw	-18
Swedes	-16	Oats	+39
		Oaten straw	+9

In explaining the somewhat peculiar results obtained in the three kinds of potatoes, the city officials said that the chief difference between the British Queen and the others is that the former is an early variety. They also stated that they did not consider that any of the crops, on the whole, could be taken as coming up to the average. This might be attributed largely to the soil, which was of a light nature and had been only recently plowed up and converted from pasture.

RAILROAD COAL CONSUMPTION

Present estimates indicate that during the calendar year 1918, United States railroads will have used about 175,000,000 tons of coal for all purposes, including both bituminous coal and anthracite. Of this amount about 157,000,000 tons was consumed in locomotive service and about 18,000,000 tons at stationary power plants and for miscellaneous purposes. In addition, the railroads used approximately 42,000,000 gallons of fuel oil.

THE FIRST HYDROELECTRIC PLANT IN AMERICA

BY C. E. DOOLITTLE

(The little town of Aspen was perhaps the first in America to have its dwelling houses as well as its streets and business houses lighted by electricity from water power. The first application of electric power to mines was undoubtedly made here. The problem of controlling the speed of a water wheel under great instantaneous load changes was first solved at the Roaring Fork Plant and the record for high head (876 ft.) for the year 1888 was probably held by their pipe line. The author was the engineer in charge of the first installation and is now general manager of the company.—The Editor.)

In 1885 The Aspen Electric Company installed at the old smelter of The Aspen Mining and Smelting Company a 60 light Brush arc dynamo belted to a Pelton wheel under 70 feet head. The arc lights were used in the streets and business houses of the town. In 1886 this company constructed a small

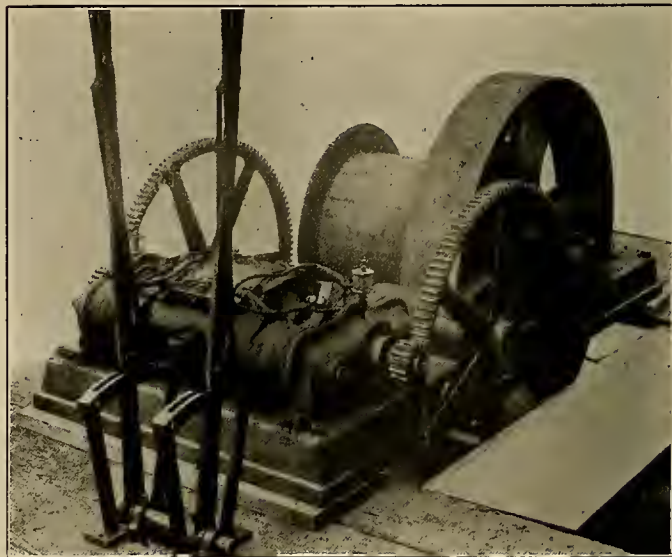
the two companies were consolidated in The Roaring Fork Electric Light and Power Company and two 40 kw. generators for incandescent lighting were installed. These were operated on the Edison 3-wire system. In the fall of that year Frank J. Sprague visited Aspen and tried to persuade the various mine managers to introduce electric power in their mines—especially for underground hoisting. None of the mine managers would take a chance, but J. H. Devereux, a mining engineer, at that time manager and one of the owners of the Roaring Fork Electric Light and Power Company, made a contract with



HUNTER'S CREEK POWER HOUSE AND PIPE LINE

This was built in 1888 and ranks as the pioneer high pressure power plant. From Hunter's Creek a flume 8,750 ft. long and 4,000 ft. of pipe line (shown in the background) furnished a head of 876 ft. This was the record for its time and the object of many pilgrimages among mining and electrical men. The pipe was a 14 in. lap-welded, wrought iron pipe with leaded joints and is still in use, having been extended a mile to the Castle Creek power house where the water from this pipe line is still producing 500 h.p.

water power plant, using a Victor turbine under 55 feet head. In the same year The Consumer's Electric Light and Power Company put in a small plant having a Pelton wheel under 125 feet head and two 60 light Brush arc machines. In the spring of 1887



ONE OF THE ORIGINAL HOISTS

This electric hoist was installed in 1887 and was made by bolting together on a wooden frame a Sprague street car motor and an ordinary mining hoist of small size. This was probably the first electrically operated mine hoist in existence.

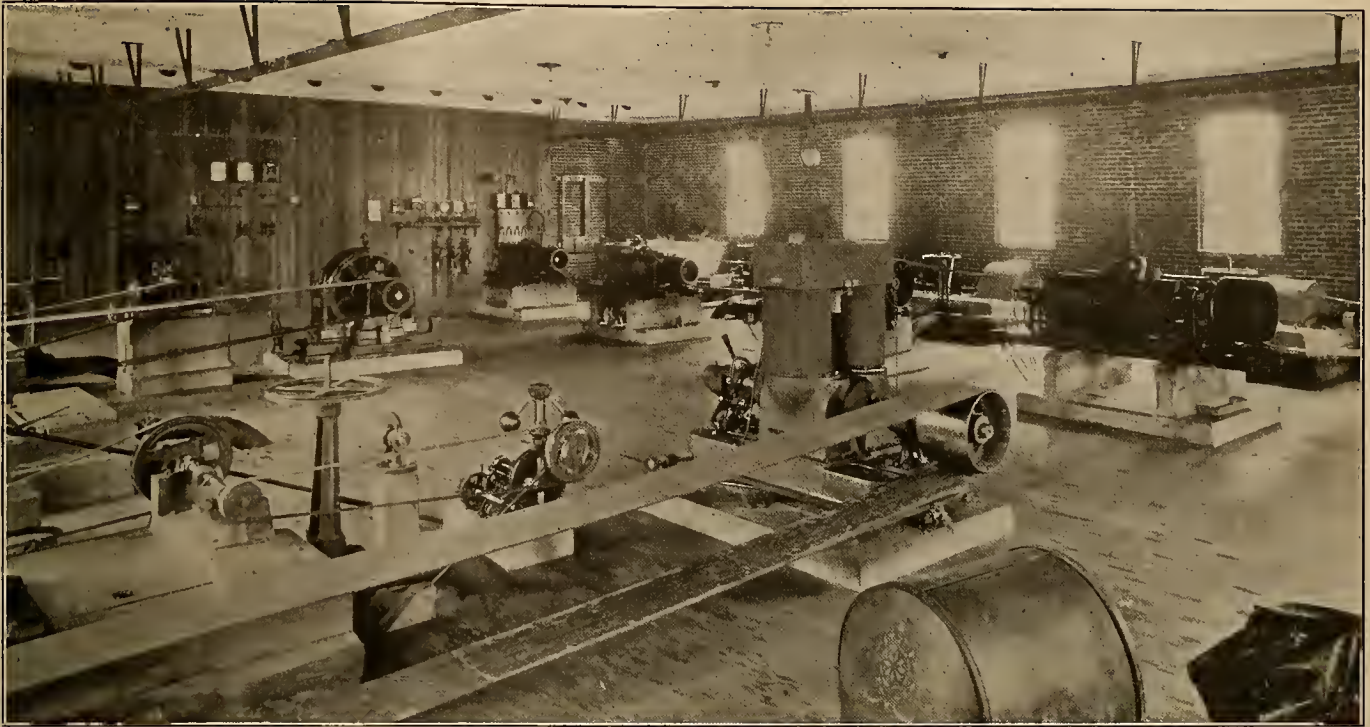
Mr. Sprague for a 45 kw. bi-polar, 500 volt generator, and a 10 h.p. electric hoist. The hoist consisted of a Sprague street car motor, geared to an intermediate shaft which was connected to the hoist drum through a flat friction drive. The generator was belt driven from a Pelton wheel, and the speed controlled by a Woodward water wheel governor. The hoist was installed in the Veteran Tunnel, 1000 feet underground, and was started in July, 1887. (This hoist is still in use but with another motor.) Two other hoists were added almost at once,—one in The Aspen mine, the other in The Regent mine. The speed of the water wheels varied greatly, but nevertheless the hoists were a great success.

The three small water powers then in use were soon fully loaded, and during the winter of 1888-89 the electric company built a new 500 h.p. hydroelectric plant, using Pelton wheels under 876 feet head. As soon as this power was available a 25 h.p. hoist



HUNTER CREEK RESERVOIR BUILT IN 1888

The Aspen Electric Company was organized in 1885 with one 50 light, Brush arc dynamo, and gradually added to its plant as needs grew until in 1888 the Hunter's Creek power house was built. The dam is a filled crib in granite wash. The mud sills were sunk as deep as was possible with only a hand pump to drain the pit. Except for one repair necessitated by a flood, the dam has been tight and solid.

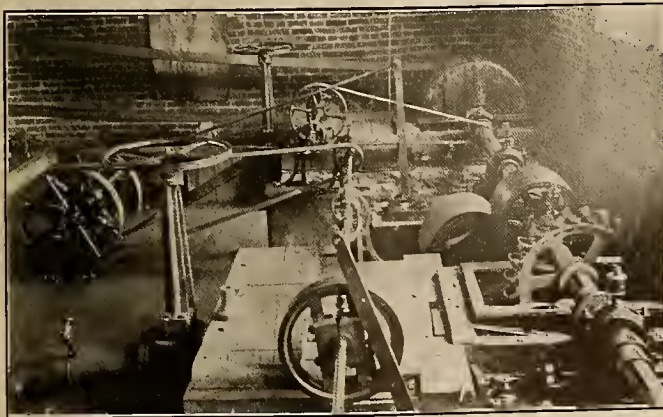


INTERIOR HUNTER CREEK POWER HOUSE

Pictures of the three small power plants which preceded it are not available but this plant itself ranks among the earliest in the country, having been built in 1888. The station was equipped with 9 Pelton wheels each 2 ft. in diameter, supplied with water through deflecting nozzles, with tips varying in size according to the power required.

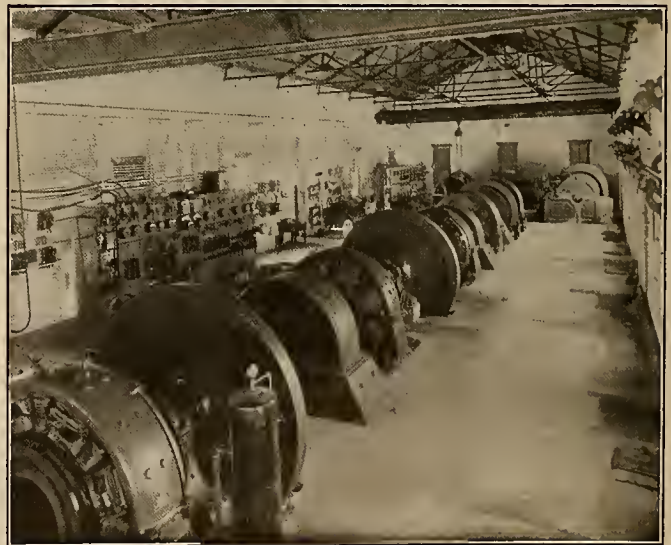
was added. When this hoist was thrown on the line the water wheel and generator came to a dead stop. This difficulty was overcome, temporarily, by constructing an iron wire resistance coil near the hoist, and arranging the starting switch so that when the switch was thrown one way the hoist was thrown on and the coil off; moving the switch the other way would stop the hoist and put the coil in circuit, thus keeping the load approximately constant and resulting in a great improvement in speed regulation. But there was, of course, a great waste of energy. The mine people were glad to have the heat from the

coil to warm the underground hoisting room, but the electric company naturally wished to sell the energy to some other mine, and to take full advantage of the



AN EARLY INSTALLATION

The wheel in the foreground was used to drive a Westinghouse alternator carrying a load consisting of incandescent lamps. This load varied so gradually that it was easy to maintain the speed nearly constant either by hand or by an old style Woodward governor. The wheel in the corner drove a 100 kw. Edison bi-polar 500 volt generator supplying power for a number of electric hoists. The changes in load were sudden and great. The pulleys of the differential governor were belted one to each of the water wheels, and when the speed of the power generator varied, due to a sudden change in the load, the shaft carrying the loose pulleys and differential gear would revolve and control the supply of water to the wheel having the hoist load, keeping its speed approximately constant. The rate at which the governor acts is proportional to the difference in speed between the two water wheels; that is, it works quickly for a large change in load and slowly for a small change.



THE INTERIOR OF THE CASTLE CREEK POWER HOUSE

This was a further addition to the system built in 1892. Originally the power was produced by five Pelton wheels in three sets and was the very latest of its time in equipment. It has since been remodeled and reconstructed and now contains 4-400 kw. and 2-200 kw., 600 v., d.c. units, each connected to a Doble water wheel.

intermittent load due to the various hoists. It was up to the electric company to invent a water wheel governor which would maintain approximately constant speed under great instantaneous changes in load. At the suggestion of W. B. Devereux, we first tried a hydraulic governor, which was the same, as far as it went, as the water wheel governors now in universal use. We had no anti-racing device, and the servo-motor was operated by water from the

pressure pipe, instead of by oil under air pressure. We used this governor for six months, but the troubles from racing and from particles of leaves, etc., getting into the regulating valve, made it unsatisfactory. The writer then invented the so-called "Doo-little differential governor," which was a success from the start and was used in our power plants for more than twenty years.

In 1892 the power company was again in need of more power, and another hydroelectric plant was built. This power house contained at first four 200

kw. generators and a number of arc lighting machines, all belt driven from a line shaft, divided into five sections by friction clutch couplings, and having five Pelton wheels. This plant has been reconstructed and enlarged so that it now contains four 400 kw. and two 200 kw. generators for mine power, each having mounted on one end of its shaft a Doble wheel, and on the other end, a cast steel flywheel. There are also two 200 kw. generators, belt-driven from Doble wheels, used for lighting the city of Aspen and adjacent mines.

SELLING ARGUMENTS FOR SOCKET APPLIANCES

BY MAE SAVELL CROY

(Selling arguments for electrical appliances which appeal to women — as reported by a woman in "Contact." Every woman wants to know how the thing works and what it will do for her — here are a few of the answers.—The Editor.)

As a woman who uses them, and appreciates their true worth, I give here a few details of what the most essential labor-saving devices will do for women. In each case I refer to the medium, or family size:

The Washing Machine

What It Will Do

Wash six sheets in 20 minutes, or the equivalent in small pieces;

Wash blankets and rugs;

Wash all fine laces without damaging them;

By means of the electric wringer, drying the clothes almost dry;

Boil the clothes in the washing machine.

What It Will Save

The wear and tear from rubbing the clothes on the rubbing board;

Laundry bills for all flat work as well as for blankets and other heavy articles;

Clothing from being ruined by careless laundries;

Children from contagious diseases often brought home in the clothes;

A woman's back, and perhaps a doctor's bill for internal injury.

This machine will pay for itself in a family of five in approximately two years; the cost of operation is 2 cents per hour.

The Ironing Machine

Iron the bulk of the ironing, including all flat pieces, such as table linen, bed linen, curtains, men's shirts, collars and cuffs, aprons, petticoats that are not too much ruffled, rompers, etc.

Four hours' ironing in one hour's time;

Give a finish to linens that it would require a double ironing by hand to acquire;

Press trousers.

A woman's back and feet and arms;

Over-fatigue in hot weather;

Laundry bills;

Clothing from hard treatment at the laundry.

This machine will pay for itself in an actual saving of money in from two to three years. The cost of operation is 2 cents per hour. The cost of heating the machine is no greater than the cost of heating the old-fashioned irons, as none of the heat goes to waste.

The Electric Iron

Finish the ironing not done on the ironing machine, such as ruffles, shirtwaists, small yokes.

Many steps to and from the stove for irons;

Heat from going to waste;

At least one-third of the time for doing the work.

It costs no more to use an electric iron than to use the old-fashioned flatirons heated over the gas stove, unless one is deliberately careless.

The Vacuum Cleaner

What It Will Do

Remove surface dirt and dust from carpets;

Free from dust draperies, upholstered furniture and clothing;

In addition to the above accomplishments, the cleaner with the motor-driven brush will shake the carpet and loosen the imbedded sand and grit which is then sucked up into the bag, pick up hair, lint and threads from the carpet and raise the nap of the carpet, renewing the brightness.

What It Will Save

Having to clean so frequently, as there is no dust flying over the room to settle again;

The throat and lungs of the one who is cleaning from being coated with dust;

The hair, complexion and hands from being made grimy with dirt and dust;

The wear and tear usually attendant on the one who has to sweep;

Laundry bills, inasmuch as sweeping is no longer a dirty job.

The Electric Sew-Motor

Relieve a woman of all strain of operating a sewing-machine;

Permit the prospective mother to sew without danger of injury;

Enable one to do a morning's work in an hour;

Sew as fast or as slowly as desired.

One-third the cost of clothing, inasmuch as clothes made at home will last three times as long as those purchased at the same price;

A woman's back and legs; and with reference to the prospective mother, a doctor's bill and perhaps a life—or two of them.

The Dishwashing Machine

Wash dishes for six persons for a 5-course dinner in three minutes;

Thoroughly clean the dishes, including egg cups;

Wash vegetables.

Putting the hands in hot, greasy dishwater;

The breaking of dishes;

An hour's time three times a day, or twenty-one times a week, in a family of six;

The drying of dishes.

The Electric Fan

Drive out the flies;

Dry fruits and vegetables and keep the room cool at the same time;

Keep the baby cool on hot days and thereby prevent summer illnesses.

Diseases that flies transmit;

Fruits and vegetables that otherwise might be allowed to go to waste;

Perhaps a doctor's bill.

The Electric Range

Cook the dinner while you are keeping the baby out of doors in the fresh air; or while you are down town shopping;

Bake, roast, boil and stew; Impart a very superior flavor to foods;

Relieve you of all thought of danger from fire while your food is cooking.

One-third of your gas bill; Fatigue from standing over a hot stove;

Food from being spoiled by burning;

Since meat deteriorates 25 per cent in weight when cooked in the ordinary oven, and only 8 per cent when cooked in the electric range, 17 per cent will be saved by using the electric range.

COOPERATIVE CAMPAIGN PROBLEMS

BY W. F. BRAINERD

(Practical suggestions from the actual experience of the California Electrical Cooperative Campaign field representative in northern California. Some most effective advertising was brought out by the Christmas campaign as is indicated below. Another hint points out a means of saving money in the use of window drapes.—The Editor.)

ADVERTISING THAT BRINGS RESULTS

One of the interesting developments of the co-operative advertising campaign which is being conducted by the California Electrical Cooperative Com-

THE SACRAMENTO BEE, THURSDAY, DECEMBER 12, 1918

—a "Gift that satisfies the sense of fitness as well as practical needs."

By All Means Make Your Gift an Electrical One

The burden of work that American genius has placed upon the shoulders of "Electricity" has surrounded the world.

Electrical appliances have become an exact science. The better class have been studied, developed, perfected. Their dependability is unquestioned anywhere. These are standard makes, all of them. Any article you select carries the assurance that it is, and will prove to be everything claimed for it. The choice of any of them should be the most natural way of showing a Friend, Mother, Father, Sister, Brother or grand old Folks of advancing years that the best is none to good for them.

When you buy "Electrical" Appliances From These Merchants, Their Electrical Knowledge is Your Protection in Buying Electrical Goods.

Cal. Mech. & Electrical Eng. Co. Sacramento Appliance Co. The Electric Shop
1117 F Street 1017 F Street 1017 F Street
"Hobrecht" Sterling Electrical Co., Inc. Electrical Supply Co.
1017 F Street 1017 F Street 1017 F Street

COOPERATIVE ADVERTISING

By combining together, these six electrical merchants of Sacramento were able to take a full page spread, with results which proved eminently satisfactory to all concerned.

mittee is the large advertisements run by dealers on a cooperative basis in various papers in the state.

A number of these ads have appeared featuring electrical goods as Christmas gifts and signed by the various electrical dealers in the town. By this co-operative effort it is possible for them to give a wide publicity to electrical goods for the holiday trade which would not have been possible in any other way.

The full page ad reproduced here was run by six electrical dealers in Sacramento. The cost of the ad was proportioned according to the benefit each dealer was expected to derive from it. All of the participants in this little campaign expressed themselves as greatly pleased with the results. No doubt the next holiday season will see a much greater use of this cooperative advertising by the electrical dealers.

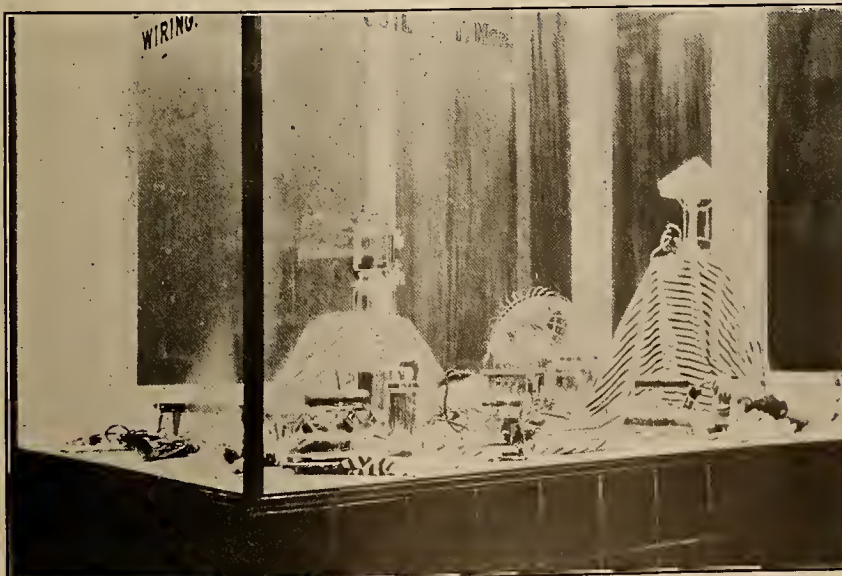
WHAT TO DO WITH THE WINDOW FLOOR SPACE

The problem of finding a satisfactory draping for the floor of the show window is one that confronts most of the electrical dealers.

Different shades of velvet are especially desirable for this, but at the present war prices it is too expensive for many dealers.

John Guilbert, of the John Guilbert Electric Company, San Jose, has found a way of overcoming this when the windows have attractive hardwood floors. By draping a runner about six feet long over the floor and bringing it up over pedestals in the rear, he is able to give his window a very attractive and rich look.

The drape shown in the photograph consists of six yards of black and white sateen which was purchased at fifty cents a yard. The use of this drapery makes a great improvement in the appearance of the window, giving it an artistic look that is sure to catch the eye of the passing shopper.

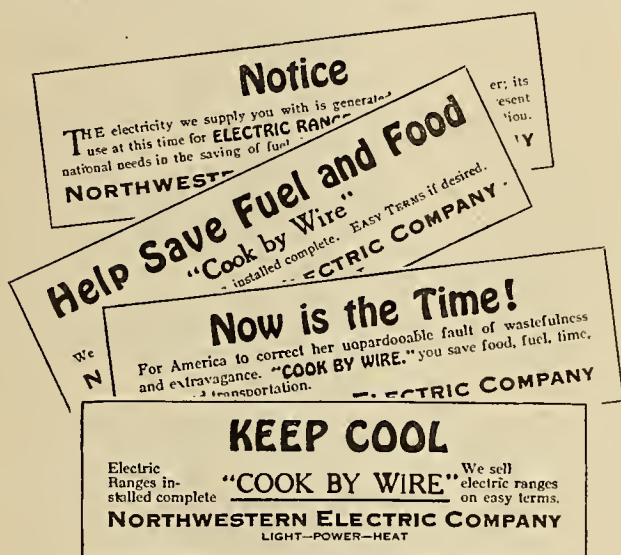


Velvet undoubtedly forms an effective background for the display of electrical ware, but it is too expensive to permit of change and variation from week to week. The problem of what other material can take its place has been neatly solved by the John Guilbert Electric Company of San Jose who have proved how effective black and white sateen can be as drape material with a hardwood window floor.

Western Ideas

"JUST A PIECE OF STRING" was the way the letter commenced—and the string was there fastened to the corner of the paper with a bright red seal. The letter went on to explain that the string was furnished in order that you might tie it about your finger and remember to attend the Jovian Convention. And although, of course, it was not tied about the finger of the reader, it was remembered just the same. Not only was the idea original and pleasing and adapted to any occasion, but the string itself was a bright blue and the seal was a bright red, and the result a patriotic and attractive blot of color which made the letter stand out from its fellows.

STICKERS are used to advertise their range business by the Northwestern Electric Company of Portland, Oregon. The little colored pasters, of which several are shown here, are about twice the size indicated—and are pasted on bills and letters which go out to customers of the company. They



Colored stickers which bring range sales

serve as a reminder of the range department—the more necessary because the company does not carry on a retail business in general appliances. The initial impetus given by the stickers is then followed up by the company's salesmen with excellent results.

Similar stickers advertising special features or with the trademark of their store have been profitably used by contractor-dealers. They find infinite application. They may be used to seal packages, to add an attractive bit of color to a letter, or as pasted on the base of electric appliances sold to serve as a constant reminder of the store where the wares were purchased.

TO THROW AWAY CARBON PAPER when it begins to wear thin, is a useless extravagance, according to Popular Science Monthly. The suggestion is there made that your used carbon or transfer paper can be made to last much longer by simply holding it over an open flame such as a lamp, candle or match, with the carbon side down. The wax substance of the unused parts will melt and run into the chinner sections of the parts which are worn out.

PERSONALITY IN ADVERTISING is always a virtue—and here is an advertisement which carries its message largely from that one element. It is simple, informal—you read it and you like it. With

Ink Ideas—Stolen From Dealers

(A Confession)

YOU see it is this way. I was to write an advertisement for the Sanford Manufacturing Company of Chicago and New York City—the old reliable folks who for nearly sixty years have made it almost a religion to produce the best inks and adhesives in America.

That was the job. The honest truth is I didn't know so very much about inks, or pastes, mucilages, good, bad, or indifferent.

So I got to wondering what the dealers thought of Sanford's goods. Aha! that was an idea! Immediately I said to the good wife,—"Won't you please go out and buy a bottle of Sanford's Ink and let me know how many of our stores don't carry it in stock and why."

I figured possibly some persuasive merchant might convince her that in some respect Sanford's wasn't quite the best, and thus I'd get a hunch where to use the soft pedal, but I was all wrong.

Here's her report: "Every last one of the six stores I visited advised me to take Sanford's on account of the excellent quality."

So I decided to canvass a different part of town myself, and for one whole forenoon went from store to store asking dealers why they bought Sanford's Inks, Paste, and Mucilage.

Result: It was one continuous testimonial to the fair and courteous treatment from the House of Sanford, and the superior quality of Sanford's goods.

I confess I have stolen the ideas of the dealers [about Sanford's products and policy.

I am writing this confession out of the ten cent bottle she bought. The label reads—

**Sanford's Premium Writing Fluid—
Blue-Black, Never Fades.**

A pleasant informality which succeeds because it sounds genuine

no particular wish to advertise the brand of ink, the advertisement is nevertheless reproduced here as a clever achievement which may suggest similar clever achievements, perhaps along electrical lines.

THE BEST OF INTENTIONS may not prevent a retail store from making enemies through a misunderstanding on the part of customers who make a deposit in connection with a request to have goods held, as a bulletin from the National Vigilance Committee of the Associated Advertising Clubs suggests. Store good-will is often destroyed through a failure to make customers, and especially women, understand that when a deposit is made, this amounts to a contract on the part of the customer to take the goods.

From various communities where there are local vigilance committees, the National Vigilance Committee has had reports of trouble arising from misunderstandings of this character.

"Can you hold this for me?" the woman asks.

"Yes, if you will make a deposit of —," says the salesman, naming the amount to her.

That is all there is to the conversation in too many instances. The salesman presumes that she knows that when she makes the deposit, she enters into a contract to buy, but that is often a violent presumption, says the vigilance committee. In a large number of instances, women return, announce

that they have changed their minds, and ask for the return of their money.

Many such cases come to the attention of local vigilance committees, for the committees advertise that they are prepared to receive complaints from persons who feel they have been mistreated. In such cities the committees, of course, take the part of the merchant, but even where there is a vigilance committee on the job, some customers still feel that an exception might be made in their case.

The vigilance committee suggests that one certain way to insure that all customers will understand the terms of such sales would be to print a special receipt for payments of this kind, the receipt to set forth the fact that unless the goods are taken by a certain date, the cash deposit will become the property of the store.

ANNOUNCING THE COMING OF YOUR SALESMAN in a way to impress the fact on the prospective customer's mind is the object of all communications preceding such calls. Some write letters—some telephone—but here is how Eardley Bros., successful firm of electrical contractor-dealers of Salt Lake City, do it. Incidentally the card is one which may be used in connection with an order concerning which there has already been correspondence



This is the reverse side of an ordinary postcard. Note the use of the trade mark in the upper right hand corner.

—or for more general purposes, when its message is still carried home.

MAKING THE WASHING MACHINE PAY FOR ITSELF was the method used by one Denver woman as reported by the Denver Gas & Electric Light Company, who are carrying on a washing machine campaign. The suggestion is one which might be passed on to customers—not necessarily as something which they should carry out, but as an interesting incident which shows the economy and practicability of the machine. Incidentally the idea may suggest to them a means of paying for a machine they could not otherwise afford.

The woman in question had purchased an electric washing machine some years ago. Recently the salesman called at the house and found that the woman purchaser had made the machine pay for itself three times. This housewife has a very fine laundry in her basement which she rents out, together with the use of the machine, four days a week at \$1.50 a day. Incidentally, the purchaser was unconsciously advertising the merits of the machine to the laundry lessees.

IT IS NOT ONLY A CONVENIENCE to your customers to arrange and display your goods in groups that are naturally associated but it is also good salesmanship to do so, according to Advertising and Selling. Among the multitude of articles displayed in the 5 and 10 cent stores there is no haphazard placing of them, if the store is one of the progressive kind. On the contrary things are so grouped that one purchase will naturally suggest another. When, for illustration, a man purchases a tooth brush, tooth paste or powder should be close at hand and if they are close at hand he will in all probability purchase the paste or the powder. But if he is obliged to go to another part of the store, he may either defer getting the latter article, or tell himself that he will get that "at the next stop."

The Monthly Sales Service issued by the Society for Electrical Development gives some excellent advice on this subject to dealers in electrical goods and the principle applies with equal force to all kinds of merchandise:

There is a way to display various articles of merchandise for sale at retail so that inspection or purchase of an article belonging to one group most strongly will suggest inspection and purchase of articles in other groups.

The inspection and purchase of writing-paper, for instance, suggests to the mind those other items used with it—envelopes, pens, ink, blotters and so on. The proper grouping of articles so associated in use makes operative the power of suggestion and promotes many purchases that otherwise would not be made.

Progressive 5 and 10 cent stores appear to depend almost entirely upon such arrangements of stock to effect sales. Study the arrangement of stock in typical store of this kind and you shortly will come to see that all is the result of careful planning. Everything reflects that aim to make the purchase of one article suggest the purchase of others related to it in use or association.

Then by way of contrast visit the average small merchandising establishment and note the haphazard arrangement of the stock. Observe that articles not associated in use are placed frequently cheek-by-jowl and that those which should be grouped are as far removed as the limitations of the store permit.

Electrical appliances and fixtures offer good returns for the slight amount of work required to arrange them so as to derive full benefit from the power of suggestion, and such groupings should be made always.

Take pencil and paper and make lists of those items of your stock which group naturally. Do not leave anything to chance. Have a "reason" for the location of every class of items in your stock. If the location of an article is discovered to be wrong, change your reasoning before you move the merchandise. That's the way to improve.

Make a diagram of your store. Study it (at home nights, if necessary). Work out the location of your groupings on paper before disturbing your stock.

RULES FOR WIREMEN

(The following set of rules for wiremen has been issued by the Pittsfield Works of the General Electric Company. They are made up of safety suggestions for all who handle electric circuits in whatever capacity and will prove of especial interest to the electrical contractor who may wish to pass some of them on to his assistants.—The Editor.)

1. General—Men engaged in the handling of electrical circuits are sometimes exposed to hazardous conditions and it is necessary that they cultivate the habit of being very cautious.

The following rules cover some of the duties and precautions to be observed by wiremen and electricians. If any of the rules are not clear or for any reason it appears necessary to violate any of these rules, consult the superintendent of the electrical department.

2. Suggestions—Suggestions, alterations or additions, which will make these rules more complete and useful are solicited.

3. Read the Rules—These rules must be read by men entering upon the electrical work and should be reviewed occasionally by those who are regularly employed in the electrical department. Men must become familiar with the conditions surrounding the work in which they are engaged.

4. Responsibility—No responsibility should be placed on a man until he has confidence and knowledge to do the work.

5. Safety Devices—Too much confidence must not be placed in safety devices which are furnished to make the work less hazardous.

Take every precaution to see that the body is well protected before any service is required of a safety device. Remember that it is possible for any safety device to get out of order and become inoperative.

6. Rubber Gloves—Rubber gloves are furnished for the use of those who require them on hazardous jobs. They must not be relied upon to furnish absolute protection. Care should be taken to keep rubber gloves clean and free from grease and other solvents of rubber.

7. Tapping Live Circuits—No repairs, alterations or examinations requiring handling of live wires should be made except in case of urgent need and then only under the personal supervision of a foreman.

8. Grounding—The frames of all motors, switchboxes, transformers, etc., must be substantially grounded.

9. Grounds—Assume that all circuits are grounded and properly insulate your body against all wires.

10. Dangerous Voltage—All voltages are dangerous for wiremen. If the voltage is not great enough to produce a fatal shock the sign should give its value.

11. Danger Signs—Danger signs should be placed at all points where one may accidentally come into contact with live wires. Signs should be removed when the danger has passed.

21. Two Men—Whenever it is necessary to make a tap in a live wire or work in the vicinity of live parts, two men must always be employed.

13. Tagging Feeder Switches—When a circuit is opened for the purpose of making changes, the controlling switch should be tagged and blocked and the tag signed by the man who opened the switch. The switch should be closed only by the man who signed the tag.

If the switch has been ordered open by two men they should both sign the tag and the switch should be closed by the station attendant only when positively notified by the two persons whose names are on the tag. Besides opening the switch, the disconnecting switches or cutouts should be opened as an additional safeguard against having the circuit closed unexpectedly.

14. Short-Circuiting Lines—Where the circuit on which work is to be done has been opened, short-circuit the wires before proceeding with the work and keep them short-circuited until the work has been completed. Don't forget to remove the short-circuit when the work has been finished.

15. Dead Circuits—Dead circuits should be treated as if they were alive. This develops a cautious nature and may sometimes prevent an accident caused by another person's error.

16. One Hand—As far as possible use only one hand when working about electrical circuits and switches.

17. Rolling Up Sleeves—Do not work on circuits with sleeves rolled up.

18. Tools—Do not use tools or ladders that are imperfect or defective. Report such matters to the foreman.

19. Rubber Mats—See that you are properly insulated from ground by a rubber mat, insulated stool, or other insulating material when operating switches, or working on circuits.

20. Fuses and Cutouts—Pull and place fuses with insulated fuse pullers. Pull the live end of the fuse out first. When placing fuses put live end in last.

Do not leave fuses uncovered. Pull and place fuses very carefully to avoid short-circuits or grounds.

21. Fusing Circuits—Motors should be fused for not more than three times the motor capacity. Lighting circuits for not more than twice the capacity of the circuit.

22. Extended Shaft—If a shaft extends beyond the bearing housing, it should be protected by a proper covering.

23. Rubber Shield—A shield may be used as a protective device for men working on poles. The shield covers the wires with which the wireman may come into contact while work is being done on a selected wire.

24. Safety Belts—Safety belts should always be worn by men working on overhead lines.

25. Caution—Don't take chances when handling electrical circuits. Be sure you are right before you proceed with your work.

26. Protection for Eyes—Heavy blue or black glasses should be worn when it is necessary to look at an electric arc.

To prevent dirt entering the eyes when chiseling

holes in concrete, stone or brick for the support of wiring devices, protecting glasses should be worn.

27. Damp Places—To avoid possible shock due to grounding, when work is being done in damp places, extra precautions should be taken to insulate the body.

28. Live Circuits—Do not work on live circuits until you have received instructions from the superintendent or foreman in charge.

Make the circuits dead whenever possible before work is begun.

29. Lamp Circuits—When working on lamp circuits be sure that you are well insulated from the ground and that the lamp circuit is open.

30. Closing Switches—Do not close a switch without full knowledge of the circuit. Do not close switch in a hesitating manner, but close it in a positive manner, using sufficient force to make full contact of blades.

31. Identity Switches—As far as possible, all wires, cables and switches should be tagged or lettered so that they may be readily identified.

32. Tampering—Employes not connected with the electrical department must not tamper with any electrical circuit.

33. Tool Handles—The handles of tools should be covered with rubber tape to prevent slipping and to reduce the opportunity for short circuits across them. Such taping should not be relied upon for safety to workmen.

34. Manholes—If a cover is removed from a manhole, see that the opening is properly guarded. If the work is being done in a manhole, there should be a man on guard at the top of the manhole.

35. Resuscitation—Learn the "prone pressure" method for resuscitation from an electrical shock.

36. Neat Wiring—All wiring must be done in a neat and workmanlike manner and in accordance with Underwriter's Rules. Wires carelessly installed are dangerous and often are the cause of short-circuits.

37. Switches—Switches should be left wide open when in the open position and fully closed when in the closed position.

38. Defective Apparatus—Report to your foreman all electrical apparatus which is in any way defective or inoperative.

39. Insulation—Do not trust the insulation on a wire for protection from a shock.

40. Doubt—If you are in doubt about the proper performance of any work which you are told to do, say so. **Don't take a chance.**

41. Joints—Connections between cables must be well made. Wires must be bound and soldered and the joint carefully insulated. When wires are held in contact by means of screws, be sure that the screws are set down tight. A slight movement of the wire or cable while setting down a screw will tend to make the joint tight.

42. Loose Ends—Do not cut the ends of wires and leave them exposed. If the wires cannot be removed, see that the ends are well insulated.

43. Tapping Insulated Wires—When tapping live insulated wires, remove insulation from only one

wire at a time. Do not expose another wire until one tap is made and joint is insulated.

44. A great many employes injured about electrical apparatus are not connected with that work. They are injured through ignorance of the danger or because effective safeguards are not provided. It is, therefore, within the province of the employes of the electrical department, to warn all persons, such as plumbers, carpenters, machinists, etc., who are working near the electrical conductors of the danger to which they are exposed.

COOKING BY ELECTRICITY UNDER WATER

One of the interesting minor parts which electricity played in the war was that of furnishing energy for cooking under water. This feat has its disadvantages, but when you have a nice waterproof kitchen on one of Uncle Sam's safe submarines it is not so bad, according to Mrs. M. A. Wilson, of Philadelphia, who trained cooks for the United States Navy.

Enlisted men were Mrs. Wilson's students and pupils and she conducted some of her cooking classes on board battleships and submarines. She tells of being 39½ hours under water on a submarine.

Housewives who are interested in submarine cooking will learn from Mrs. Wilson that the intense cold from the bottom of the ocean must be considered by the submarine cook.

Electric Stoves Used

"Electric stoves are used," she says, "but food which requires a high temperature must be cooked before the submarine is submerged."

She tells of her work in this way:

"I began with a class of 50 men. Today I have 1,000 men under training.

"I have spent days taking oil ranges apart to find out why the men could not make them work, finally discovering that it was because they had kept the flames too high. The work done has conformed entirely to navy requirements. One must find the amount of food named in the regulations to serve at a cost of 45 cents a day.

Course of Five Weeks

"The cooking course lasts five weeks, every day from 5:30 a.m. to 7 p.m. Every man must know how to make bread and under very different conditions from those on land. The variation in temperature is great and the water used must come from the ocean.

"The boys are enthusiastic about their work and I don't believe I have ever seen a finer class of men. We have doctors, lawyers, clerks—all professions and trades represented. There have been practically no failures.

Her First Class

"In Boston 225 men were turned over to me to train as commissary stewards. I did not know what was required of such an officer. I went to Cape Henlopen to find out what a commissary steward was supposed to do. Then I immediately put these 225 men into white suits such as navy cooks wear and put them into the kitchen to learn how to cook as a foundation for their work."

THE CONTRACTOR-DEALER SITUATION

BY M. A. DELEW

(The recent get-together dinner held in San Francisco between the Pacific Coast Section N. E. L. A., the San Francisco Electrical Development League, the Electrical Contractors and Dealers' Association and the Pacific Coast Electrical Supply Jobbers brought out much of general interest in the speeches and discussions. The following paper by the president of the California Contractors and Dealers' Association ably presents the point of view of his branch of the industry.—The Editor.)

The only way I know of bringing to your attention anything that will interest all those present is to present what might be termed the contractor-dealer's troubles.

The contractor-dealer is primarily the agent of the power companies, to get business for them. He must not only get business but it must be of a desirable class. Should he fail, he at once sinks into oblivion in the eyes of the commercial manager and is discarded.

Right here, permit me to speculate on the building of a foundation that might prevent disasters of this character. Can a contractor-dealer bring about desirable results without the assistance of the commercial manager? He cannot. But, rather, he can bring about results in direct proportion to the co-operation extended him by the commercial manager of the power company.

Especially in the past, and even at this time, there is not that coordination of effort which might produce the maximum of results.

Would it be presumption on my part to suggest that you take the contractor-dealer into your confidence and inform him just what different kinds of business you may find most desirable in the various sections which comprise your systems? For the past year or more we have been doing quite active duty in the line of socket appliances and with considerable success, but there are larger and more important efforts to be undertaken if anything like maximum is to be reached.

For the contractor-dealer let me ask: What can we do, either individually or collectively, to create or assist in the creation of desirable new business?

Another and no less important branch of our industry is that of the manufacturers. In bygone days, the manufacturers, actuated by their own interests, really accomplished a great work of cooperation by visiting the contractor-dealer and explaining the many superior points of mechanical construction, as well as the high commercial or electrical efficiency of the articles of their production. This practice should not only be renewed, but with increased vigor. What I would like to do is to drive home to the manufacturers this point: that because Smith buys from Jones, is no reason that Smith should be left to believe that Jones sells all the good things that are to be obtained in the whole world. Get your articles of manufacture before the contractor-dealer; his private opinion does not count—the industry needs every article of merit.

Another important branch of our industry, the supply dealer's. He, like the rest of us, already has had his hands blistered, but like the balance, his

hands have not begun to get sore. I imagine that the supply of materials and the method of distribution are like the "poor," always going to be with us, although I believe they are moving in the right direction. If I be permitted to venture an opinion let me say frankly: That until such time as the supply dealer shall arrive at the conclusion that "trade discounts" shall be extended only to concerns whose duty it is to promote the welfare and integrity of the electrical industry, the water is too cloudy and the stream too deep for all to ford.

Notwithstanding the conflict of opinions, all branches of our industry have been able to maintain the most friendly relations. The contractor-dealer feels that this opportunity to express his ideas is but another link in the chain that shall more closely unite us.

In the past, the very existence of the contractor-dealer depended on his merits in the creation of new business, and entirely too often, gentlemen, he has seen the fruits of his labors plucked by unjustified business transactions.

Finally, it may appear to some of those present that the ideas expressed by me border too much on "capitalism" in this day of so-called "socialistic tendency." It matters not in what category or under what "ism" your imagination shall embrace them, the proper coordination of all essential branches of the electrical industry must be benefited if we are to attain real success. No one in the industry appreciates more than the contractor-dealer the rapidity with which the day is approaching when no legitimate business can permit to exist any recognized adjunct whose aim is to take, and rarely, if ever, to give.

UTILIZING THE BILL to bring about better feeling between you and your customer is rather a novel suggestion—but this is just what has been done by the San Joaquin Light & Power Corporation, who make use of the vacant space on the back of their bill forms as is here shown. In place of the bill bringing a feeling of irritation, therefore, it bears

CONSUMERS! PLEASE TAKE NOTICE

It is the policy of this Company to satisfy every one of its consumers. We are continually striving to render the most efficient service possible and we invite suggestions and criticism at all times. If there is anything at fault with your service, we cannot become aware of it until you have brought the same to our attention. If you have any question concerning your relations with this company, we request you to call immediately at this office and put the matter before our representatives. It is our privilege to explain our rates and regulations and to make any adjustments necessary for their more perfect application. Our aim is for a continuous, courteous, efficient service and we will welcome your hearty co-operation.

A. G. WISHON, General Manager.

This plea for cooperation covers the rear side of the regular monthly bills

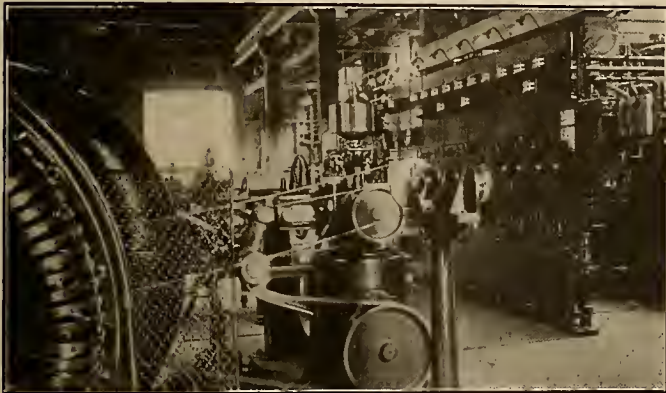
its soft answer always with it, to turn away any wrath the unreasonable consumer may chance to feel. The position of any organization depending on its character as it is understood by the public, it is obvious that this form of advertising is most effective—and the suggestion is one which might be applied in other forms to retail stores or contractors' monthly statements.

THE POWER PROJECT AT HETCH HETCHY

BY RUDOLPH W. VAN NORDEN

(The Hetch Hetchy water and power project as planned by the city of San Francisco involves a development of power at Hetch Hetchy, another just above Early Intake and a third at Moccasin Creek. Of the three the one at Moccasin Creek, involving the development of 66,000 h.p., will be the only one carried out in the immediate program. Details are given below. The author, who is a well known engineer of San Francisco, has recently described the project in general for the Journal of Electricity and is intimately familiar with its progress.—The Editor.)

The invert of the tunnel at the Early intake is at El. 2320 while at the Priest outlet portal it is 2170 ft., a total fall of 50 ft. in 18.4 miles. The diversion in the Tuolumne river will consist of a cyclopean arched dam 40 ft. high, whose crest will be at El. 2340, or 20 ft. higher than the tunnel invert. It is proposed to install suitable gates in the dam and through these the flow will pass into a



The interior of the temporary power plant now located above Early Intake. This is to be discontinued when the complete development carries the water from Cherry Creek and Eleanor to the Hetch Hetchy through the Eleanor tunnel.

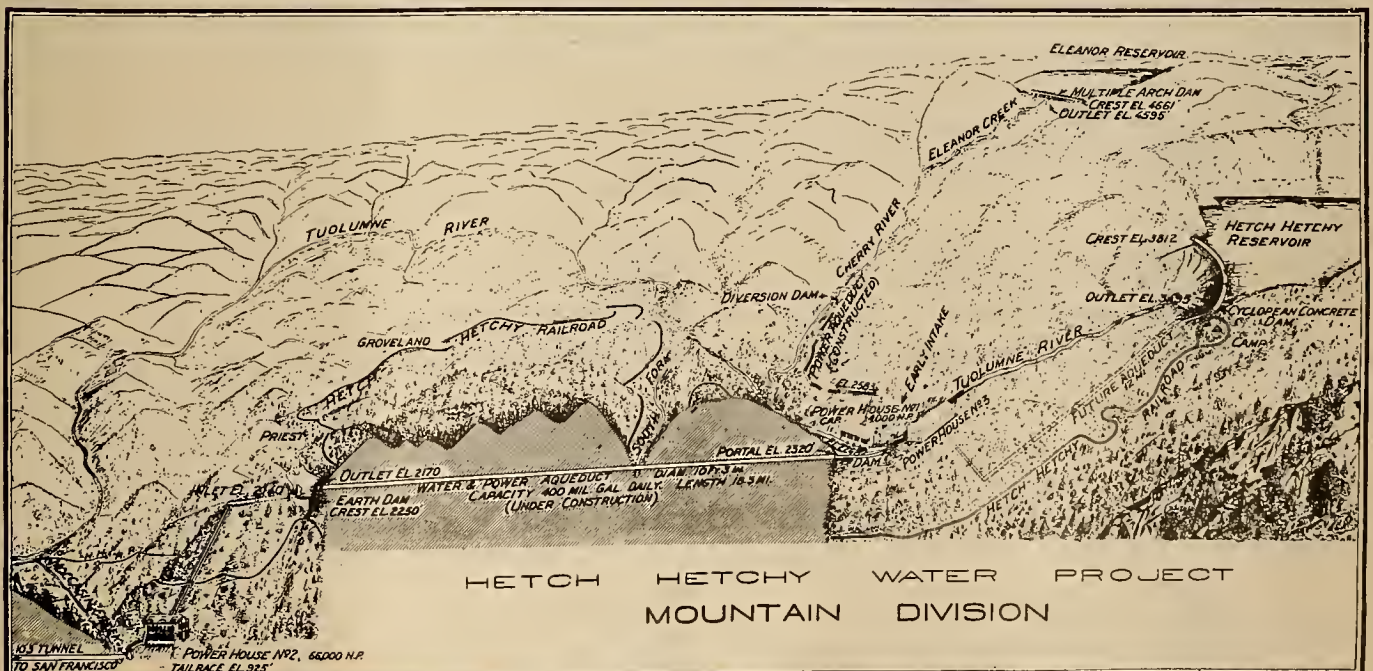
reinforced concrete pressure conduit, which is to be laid along a bench, which is now partially excavated, to the intake portal, the concrete pipe and tunnel to form a continuous pressure conduit.

Moccasin Creek Forebay Reservoir —

The flow from the tunnel will be delivered directly into the forebay reservoir of the Moccasin Creek power house. This reservoir will cover an area of 50 acres, and will have a capacity of about 3,000 acre-ft., equivalent to 1,000,000,000 gal., although this estimate may be somewhat increased depending upon the location of the dam which has not been entirely, as yet, determined. The dam will have a height of about 150 ft. and will be an earth structure of the hydraulic fill type. Test holes have been sunk to determine the condition and depth of bed-rock, which appears to underlie the site. The crest of the spillway in the dam is to be at El. 2250, or 80 ft. higher than the Priest outlet invert. The dam is at the south end of the reservoir, while the outlet to the power house penstock is at the opposite, or upper end. This outlet is to be at El. 2140, or 30 ft. below the Priest outlet portal and 180 ft. below the reservoir surface, when full.

Moccasin Creek Power Plant —

A concrete tower intake with necessary gate mechanism will be built to control the flow from the reservoir into the penstock, which for a distance of $1\frac{1}{4}$ miles will consist of a concrete lined pressure tunnel, passing under the ridge north and west of the forebay and emerging near the top of a knoll overlooking the power house site on Moccasin Creek. From the end of this tunnel a steel header, sealed



A profile drawing of the Hetch Hetchy project which shows the location of the Early Intake and the proposed Moccasin Creek power house

into the tunnel, will distribute the water to a number of pipe lines, which will follow the slope of the hill to the Moccasin Creek power house. As the tunnel and pipes will be continuous, the pressure at the power house will be due to the head measured from the surface of the reservoir. The total length of the penstock from intake tower to power house will be 1.9 miles. The maximum static head at the power house will be 1325 ft. The conduit being designed for a continuous flow of 400 million gallons daily, or 618 second feet, the output of the plant will be 66,000 h.p. On this basis it is proposed to install three units. In view of the large capacity of the forebay reservoir and hence the possibility of taking advantage of this reserve to meet the requirements of a variable daily load, i. e., a fairly low load factor, it is proposed, eventually, to increase the installation of this plant by 50 per cent.

It is planned to build a low dam in Moccasin Creek, forming an afterbay into which the water from the power house will be discharged, and from this small reservoir the water to be carried to San Francisco will be delivered into the second main tunnel unit. Until the San Francisco conduit is completed with a capacity for 60 million gallons daily (or if other points outside of San Francisco be supplied, 120 million gallons daily), the discharge from the power house will flow down Moccasin Creek to the Tuolumne, and that which is not sent on, after the conduit shall have been completed will continue to flow back to the Tuolumne. No construction work has been commenced on the continuation of the conduit line and cannot be until assurance of the necessary financial support by the sale of bonds, provided therefor, is had. Preliminary studies of routes and structures have been made, and rights of way for the San Joaquin valley pipe crossing have been negotiated for. Provided that active construction work can be started in the immediate future, it is estimated that the first unit of 60,000,000 gal. per day can be delivered in San Francisco within a period of five years.

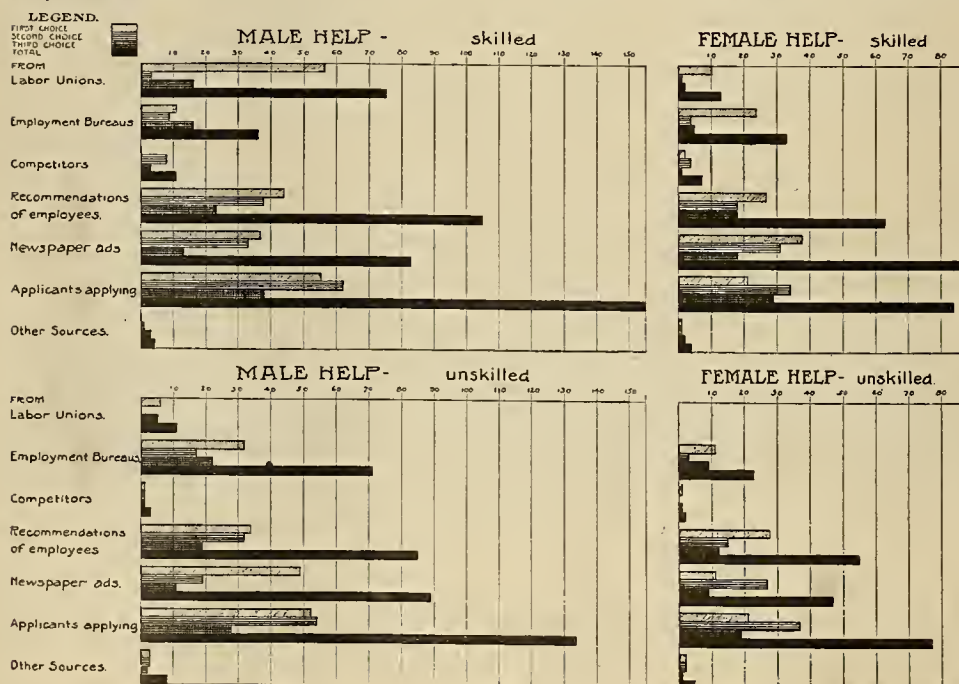
WHERE DO YOU GET YOUR HELP?

A recent survey of manufacturing firms in San Francisco by the Society for the Study of Employment Problems, as reported in the bulletin of the San Francisco Chamber of Commerce, has revealed the fact that most workers seek their own positions. The accompanying chart is the result of a questionnaire that was sent to all of the larger firms employing labor for manufacturing lines. Each firm was asked to designate a first, second and third choice.

The fact has been brought out that the men and women seek their own work and that the plant does not go after the worker. This is brought out by the long line showing the popular method of securing help is through the applicants applying for positions and through the recommendations of those already employed. The surprising fact is emphasized that employment bureaus are not used to such an extent as are these other methods. Newspaper advertising is resorted to only in the case of unskilled male and female help. Labor unions are evidently patronized where the male skilled help is unionized.

A study which would include sources of supply for office help and higher positions would be of great interest—and would undoubtedly reveal that here, as elsewhere, methods are more or less haphazard. No efficient means of bringing employer and employee together is in vogue, the group from whom the selection is made is usually limited by acquaintance or mere chance, and there is little guarantee that the best person is in the best position.

In this connection, the employment service the Journal of Electricity still maintains, the Service Bureau of the United Engineering Societies of San Francisco and the new bureau of occupations for men and women graduates which the University of California is organizing are all of interest as beginnings in the right direction. The Journal of Electricity keeps a file of applicants for positions of a commercial and technical nature and is glad to furnish these names to any employer interested.



A survey of the methods of obtaining help as practiced by the factories of San Francisco. This indicates that the great majority of employers pick up their help from those who happen to drift to their doors, much as a mollusk obtains its food.

ELECTRIC SMELTING ON THE PACIFIC COAST

BY W. L. MORRISON

(The high prices of the war developed the smelting industry in the West and created an opening for the use of the electric furnace. The absence of cheap power precludes a general development along this line in normal times, but there is a real opportunity in the smelting of silicon manganese as pointed out in this paper, which was given recently before the Portland sections of the A. I. E. E. and N. E. L. A. The author is manager and metallurgist of the Western Reduction Company of Portland.—The Editor.)

Electric smelting, aside from the steel and iron industry, is a new venture in the Northwest. At the present time there are plants located as follows:

Pacific Electro Metals Company, Bay Point, California.
Noble Electric Steel Company, Heroult, California.
Western Reduction Company, Portland, Oregon.
Bilrowe Alloys Company, Tacoma, Washington.
Seattle Smelting Company, Seattle, Washington.

These plants up till very recently were all producing ferro-manganese in some form or other.

Ferro-chrome, ferro-tungsten and ferro-molybdenum have been produced to some extent on the Pacific Coast, but at the present time I do not know of anyone carrying on operations; however, some of the plants on the coast are contemplating the manufacture of the above alloys.

Cheap Power a Necessity

Cheap power is one of the big factors which attract electrochemical industries. With very few isolated cases we have no cheap power on the Pacific Coast today for electrochemical manufacture.

When the cost of power becomes a large part of the manufacturing cost, in order to meet competition we must have competitive rates. For example, the power used in the production of ferro-silicon is so great per ton of metal produced that a difference of one mill per kw-hr. increase in power rate above what other manufacturers are paying, would put you out of business, other things being equal.

In the case of steel furnaces the variation of a few mills per kw-hr. makes very little difference, for there is used only 600 to 800 kw-hr. per ton of steel, while in the case of ferro-silicon we use 7000 to 9000 kw-hr. per ton of metal, and electric furnace steel sells at a higher price than ferro-silicon. The same may be true with other ferro-metals to a greater or lesser extent.

Types of Furnace

Manganese and chrome require very much the same kind of furnace for their production. The simplest form of furnace is the single phase furnace which consists of a large pot with a terminal in the bottom, either a water-cooled iron plug or a conducting hearth of carbonaceous material. A tap hole is placed at the bottom of the lined crucible for removing the molten metal and slag.

A carbon electrode is suspended in the pot forming the other terminal, which is movable to regulate the current in the furnace. Various modifications of this furnace are used, depending on the size of installation, the more common type being the three-phase furnace in which three or six electrodes are used.

The Acid and Basic Process

There are two practices followed in the smelting of ores, the acid and basic, with some slight modifications. These terms refer to the condition of the

slag during the smelting operation. The acid slag is one in which the silica predominates, making a glassy slag. In the case of the basic slag, lime, iron, magnesium or some other such bases are present in greater quantity than that required to neutralize the acid silica. If the bases are in such quantity as to just neutralize the silica, the slag is termed a neutral slag.

The linings of the furnace should be such as are not readily attacked by the slag employed. For example, an acid slag requires a silica lining, with a basic slag a magnesite lining is used. When the operation is such that a carbon lining will not contaminate the product, this lining is to be preferred, as it will stand up very well under either acid or basic conditions.

The Production of Manganese

Both methods of smelting are followed in the production of manganese. The extreme acid practice (i. e., when little or no lime is used) gives a high silicon and low carbon content in the ferro, a type which before the war was imported from France to some extent.

The basic process in the production of manganese gives a lower silicon and higher carbon content. This is the more common form of ferro-manganese on the market.

Other Products

In the production of the ferro-chrome, the same holds as in the case of manganese, except in the case of the higher grades or so-called low carbon ferro-chrome products.

The production of tungsten and ferro-molybdenum is carried out in a somewhat different way from that of manganese and chrome on account of their high smelting points when nearly pure. The common alloys run from 70% to 85% tungsten or molybdenum.

The Type of Furnace

The process for producing the ferros is almost universally carried out in a single-phase furnace or pots averaging from 25 kw. to 100 kw., the commonest size being about 50 kw. These furnaces operate with the single electrode. The pots vary in size from 10-inch inside diameter up to 24-inch and from 24 inches to 36 inches high.

The pots are placed on large terminals either of iron or carbon material, and after the operation is completed the pots are removed and new ones started.

The metal is allowed to accumulate in the pots by tapping the slag from time to time through an opening punched in the lining of the pot at the top of the metal. The ore and flux is charged into the pot intermittently after the tapping of the slag.

At the end of the operation, when the pot has become too full for economic operation, it is removed and broken open and the button of metal is removed and crushed. The weight of the buttons varies in size from 500 to 3000 pounds.

One ton of tungsten or molybdenum requires 8000 to 10,000 kw-hr. per net ton of metal.

One net ton of metallic chrome (60-70% alloy) requires 10,000 to 14,000 kw-hr.

One long ton of 80% ferro-manganese requires 3500 to 5000 kw-hr.

Discussion

Q. Where does the Western Reduction Company obtain their electrodes?

They are equipped to manufacture them at their plant in Portland, in sizes of from 10 inches to 20 inches in diameter and up to 8 feet in length. There are two processes used in the manufacture of electrodes, the Rammed and the Extruding processes, and the former is used by this company. Colorado anthracite coal is calcined in a special electric furnace, and all of the volatile material is driven off. It is then ground fine and mixed with 15 to 20% of pitch. The pitch must not be too hard. It is then pressed into shape and again calcined. A socket and pin joint is made on them in order to connect them together.

Q. Where are the greatest deposits of ferro-manganese found and what was the price before the war?

From Japan, the Phillipsburg district in Montana, Russia, South America, and Macedonia. The price laid down in Germany before the war was \$4 to \$6 per ton, the freight alone from Phillipsburg to the East was \$6 to \$8.

Q. What controls the price of ferro-manganese in normal times and what were the prices during those times, also the war prices?

The blast furnaces control the price and the electric furnace cannot compete. The price in New York per ton before the war was \$12 and during the war \$250.

Q. Are there any chrome deposits in Oregon and is there any difficulty in obtaining it? What was the price before the war?

Transportation is the greatest problem, the main deposit being 14 miles from a railroad. The price in New York was \$12.

Q. How much manganese is there used in ordinary steel castings?

Four to eight pounds to a ton.

Q. How much manganese is used in manganese steel?

One hundred and forty pounds approximately to a ton.

Q. What does manganese do to ordinary steel?

It adds to its tensile strength and eliminates "blow holes," but makes it so it cannot be machined. The only way to work it is to grind it.

Q. Is there any advantage of smelting in the West over the East?

As it takes 2 to 3 tons of ore to make a ton of steel the freight rate helps the West. If power could be obtained for \$18 per h.p. per year it could compete.

Q. Do you see any field for electric smelting in the West?

Yes, the smelting of silicon-manganese.

Q. What is the load factor of your furnace?

95% or better, on 25 cycles.

Q. What is the power factor?

95% to 96% on 25 cycles.

Q. What is the best type of furnace for iron smelting?

The three-phase furnace and about 60% of those in use are three-phase. With the one-phase furnace the lower contact burns off and the metal goes through the bottom of the furnace. With two electrodes the bath gets easily carbonized. With the induction furnace, the power factor is low and the radiation losses are great. The electrode loss of a three-phase furnace is about 8%. The best voltage is 60 to 70 volts. If higher voltage is used, too much volatilization is produced.

Q. Is the current balanced between the phases of a three-phase furnace?

With manual control it is balanced to within 3% except on starting, and this is seldom necessary as the furnaces are fed continuously from the top and tapped at the bottom without any disturbance of the electric regulation.

Q. Why don't the electrodes short circuit?

Due to the low content of the ore when cold, when the slag gets fluid at about 3300 degrees F. the resistance becomes constant. The circuit is also protected by a circuit-breaker for emergencies.

ACHIEVEMENTS OF WAR APPLIED TO PEACE

With the cessation of war the Germans, it is said, will never be able to realize what the full force of America's military might would have been, or the many devices and methods that were the result of American ingenuity, for the War Department is keeping the best of these a profound secret.

At the same time great good for the future peaceful pursuit of industry in this country and for the saving instead of killing of men has come out of this welter of death-dealing experiments, is the claim of the Bureau of Mines. Certain experiments with delicate instruments known as microphones and geophones, in order to detect the direction and the distance of enemy mining work in tunneling and the location of enemy artillery no matter where placed, has disclosed that these same instruments can be of use in determining the location of men entombed in mines following disaster. It is expected that, if the men have the presence of mind to make even a slight noise, the rescuers listening with these devices will be able at once to locate the men and begin the rescue work. Men thus entombed have been known to live for a week or longer under such circumstances, the rescuers being unable to find them. Other men have died before they could be located. The bureau will equip its rescue cars as soon as possible with these devices.

The war experience of the bureau is going to help peace industries in still another direction. The coal experts, eager to do their share in winning the war, were assigned to the testing of boilers to be used in the ships of the Emergency Fleet Corporation. Speed and the saving of coal were demanded. The result was that the experts so changed the design of the boilers that the coal heretofore necessary to send the ships along for six miles was sufficient to carry them seven miles. This great saving will be available in peace times.

Through its investigation of natural gases the bureau with the cooperation of the Army and Navy conducted important work relating to balloon gases. This work included the development of certain products for use in balloons that can be obtained from natural gas. No more can be said about this work at this time.

It was soon found that there would be a tremendous demand by the military authorities for the so-called war minerals. With the havoc wrought by the submarines, the world was short of shipping and the United States was informed that these minerals should come from American mines, many of which were either inadequately developed or not developed at all, because this country had been depending on foreign sources of supply. The bureau was called upon to furnish these minerals and within a few months there had been developed a sufficient quantity of some to supply all war needs and a surplus of others. It is now said by the bureau that the metal mining industry has received such an impetus by this war demand that it will be in peace times a much greater and more prosperous industry than ever before. "America has been discovered by Americans," said Secretary Lane when he heard how the industry had responded to the war call.

THE AWAKENING OF A NEW NATION

(Much of northern and central China is ready to pass from the agricultural to the industrial stage. The development which the war has brought about opens a period of singular opportunity. This comprehensive survey of the industries, resources and trade conditions in China, as arranged by the Asia Banking Corporation, will be of interest to all engineers and business interests who are looking toward the Orient with new enterprise.—The Editor.)



Sunset on the Yangtze Kiang—the great water way of northern China. This river is 3,000 miles long and navigable almost its entire length.

HILE the present war has been the most destructive in the experience of mankind, it has also been one of the most powerful constructive elements the world has ever known. It has affected, directly or indirectly, every nation on earth, and, through the dire necessity occasioned by it, has energized practically all humanity. The impetus, too, which it has given to nearly all peoples will not have been spent by the time

peace is declared, and unquestionably will result in a great world-wide development.

The possibilities, indeed, are plainly forecast today in China, which is one of the very richest fields awaiting commercial, industrial and financial cultivation. The steadily increasing influx of foreigners into China since the beginning of the war is significant of vast future potentialities, as well as of the fundamental and far-reaching political and social changes which are transforming China into a country of attractive business and investment opportunities. Ample evidence of the growing realization of China's commercial possibilities is to be found in the latest official reports which disclose that there were in China in 1917, 7,055 foreign firms and 220,485 foreign residents, as compared with 4,742 firms and 185,613 residents in 1914.

Shanghai

While China has more than 2,000 miles of coastline, it has very few harbors suitable for trade purposes, chiefly because they lack adequate means of communication with the interior. Shanghai, with a population of about 700,000, is the only port which has a natural waterway extending far into the interior of China. It is located on the Whang-pu which runs into the estuary of the Yangtze River which opens up the central portion of China to the trade of the world. It is navigable, except during the dry season, to Hankow, for a distance of 600 miles for ocean steamers and for small steamers to Ichang, a distance of more than 900 miles, and for small river boats to a distance of 1,700 miles from the sea coast.

The valley of the Yangtze River is the only one of material size in China and in extent is somewhat comparable to our great Mississippi Valley, except that it is broken up into basins by intersecting mountain ranges. The basins of this valley are among the most fertile sections of China. In addition

to the Yangtze River, Shanghai is connected with the great agricultural region extending northward 750 miles, by means of the Yangtze River and the Grand Canal reaching Tientsin, and also by a railway line which extends from Shanghai through Nanking, by ferry to Pukow, Tientsin, and Peking. Shanghai ranks as the first port of China. Approxi-



FROM THE CANTON WALL

Canton is the great interior center of the south—a district which has been prominently featured, although northern China holds perhaps the greater possibilities for western development.

mately 40% of the entire trade of the country passes through this port, the value of which in 1917 amounted to over 407 million Waikwan Taels (as the rate of exchange for that year, one Tael equals approximately \$1.03).

Shanghai is primarily the distributing center of China and in addition, the most important industrial center. The main industries are cotton spinning and weaving, and that Shanghai will be the center of the cotton industry of the Far East is indicated by the shifting of other cotton plants from less convenient places to that city. Another important industry is silk filatures, which gives employment to about 20,000 workers. There are also extensively developed soap works, chemical works, paper and flour mills, tanneries, oil mills, match factories, tobacco factories, printing and lithographic works. Large engineering and shipbuilding establishments form very conspicuous features of this place, and it is interesting to note that the United States Shipbuilding Corporation has recently closed a contract for the construction of several vessels with a Shanghai shipbuilding company. All the materials, except 40,000 tons of plates, are to be obtained in China.

Peking

Peking, the capital of China, has a population of over 1,000,000. In addition to being a political center, it serves as a commercial focus on account of its good communication with other parts of the country. Railways connect it directly with the great commercial cities, such as Kalgan, Tientsin, and Hankow. In addition to the railways, many roads radiate from Peking, the longest being that to Lahassa,

the capital of Tibet, which is 4,713 miles, and the daily arrival of caravans adds to the picturesqueness of the city. Water traffic is unloaded at Tungchow, a few miles to the east, and is transported by cart over a stone road to Peking. Tungchow is on the Pei River and is connected directly with Peking by an artificial canal.

Tientsin

Tientsin, with a population of about 800,000, situated at the junction of the Hai River and the Grand Canal, and a railway center for many lines, is, in both a commercial and industrial sense, the most important city of North China. Through the junction of the Peking-Mukden and Tientsin-Pukow railway lines and the proximity of the Peking-Hankow line, Tientsin is in touch with the Lower and Middle Yangtze regions, with Peking, Korea, Manchuria, and Europe. A large shipping trade is carried on from March to December, both in Chinese and foreign vessels. The leading industries are the making of Chinese rugs and carpets, wool cleaning and packing, braid making, bristle sorting, salt production, and the tea transit trade, developed by the Russians. The iron industry is also becoming an important factor. The chief exports are raw cotton and wool, goat skins, pig bristles, linseed, ground nuts, spirits, medicine, beans, etc. The chief imports are cotton goods, cigarettes, kerosene, machinery, railway material, sugar, and flour.

Hankow

Hankow, with a population of 800,000, is the leading commercial city of central China, and is probably destined to be the Chicago of China. It is located about 600 miles from the sea on the left bank of the Yangtze River, at the limit of navigation for ocean-going steamships, and by these it is attainable for some nine months of the year. Small river steamers and boats are able to navigate over 1,000 miles farther up the Yangtze River to the west of Hankow. Through the Yangtze River and the Poyang Lake, Hankow is in direct communication with the resourceful provinces of Kiang-so to the south. The southern terminus of the Peking-Hankow Railway, and the important northern terminus for the Canton-Hankow Railway, the Hankow Railway and the Hankow Szechwan Railway, which is under construction, will make this port the leading city of central China. Hankow, Wuchang and Hanyang, known as the Wuhan group of cities, with a population of 1,300,000, form the commercial, industrial and financial heart of China and occupy a position unique both commercially and economically. It is estimated, in fact, that Hankow is the distributing point for more than 80,000,000 people.

The tea industry has become the principal one of Hankow in recent years. There have been established also match and albumin factories, and the curing of hides is carried on extensively. Hankow's main exports are beans, bristles, flour, furs, hides, iron goods, silk, tea, and wood oil. The imports are rice, sesamum seed, tobacco, silk, sugar, medicinal plants, musk and furs from the interior of China; and from abroad, cotton goods, sugar, kerosene and sundries.

Harbin

Harbin, with a population of 65,000, is the most important trading center in Manchuria. Its location on the Sungari gives it direct water communication with Vladivostok. Here also is the junction of the Chinese Eastern Railway with the South Manchurian



THE STREETS OF HONGKONG

A Southern China port but characteristic of the way the Occidental transforms the districts he develops

Railway. The former road is a link in the great Trans-Siberian system, while the latter line leads to Dairen and Port Arthur. Both roads have tributary lines in Manchuria, and Mukden is the junction point of the South Manchurian Railway with the lines leading into China proper and Korea. In March, 1916, Russia obtained permission to build a road northward from Harbin by way of Mergen to Blagoveshchensk with a branch line to Tsitsihar. As an important gateway into Mongolia, Harbin will benefit by whatever industrial development may take place in this province. Harbin is the center for all trade routes in Northern and Central Manchuria and the great center of foreign trade exchange, particularly between Russia and China. Foreign goods, as well as locally manufactured products, are not only consumed on the spot in large quantities but are also in demand in the other markets dependent on Harbin. It is the center of a great expanse of territory in which the soya bean is extensively cultivated.

The goods in demand there include textile fabrics, cigarettes, beer, spirits, etc. Harbin is a large export center of all kinds of grain, soya beans, and

eggs, and there is an increasing exportation of meat, hides, wool, and kindred products.

Resources

The territory has a variety of resources and a variety of climatic conditions, varying from the cool temperate section of northern Manchuria to the sub-tropical section of the area tributary to Hankow and Shanghai in the south. Manchuria in the north is primarily an agricultural section, resembling Dakota in climatic and physical features, with an area greater than New York, Pennsylvania and Texas combined. The principal agricultural products are beans, maize, millet, wheat, wool, tobacco, hemp and rice. The agricultural products which figure mainly in the export trade are beans, bean cake, bean oil, and cereals.

Manchuria has large areas of virgin forest, but adequate transportation is lacking to make the timber resources of much commercial value. Mineral wealth is abundant, southern Manchuria being one vast coal field. The Fushun mine is probably the best known of those now in operation, with 20,000 workers. It is estimated that the seams which are being worked contain approximately 800,000,000 tons of easily accessible coal. Coal is found quite generally in the northern part of Manchuria, but primitive mining methods and lack of adequate capital have prevented the full development of coal mining in this section.

China, at its present stage of development, is mainly an agricultural country. The great plains of the northeast form a great half circle with the Shantung peninsula at the center, and the extensive flood plains of the lower Yangtze constitute the only large plains areas in China, which comprise scarcely one-eighth of China's surface. Elsewhere only the narrow flood plains and small deltas relieve the usual monotony of the slope and mountain regions. The northern or great plains constitute for the most part the Hwang-ho delta, reaching inland for 400 miles. The Yangtze plain extends inland in a series of basins for 600 miles, separated from the great northern plains by ranges of hills and mountains. These two plains coalesce, however, in the east so that continuous wide plains extend from Hang-Chow to Peking, a distance of about 750 miles. The Yangtze plain extends inland 1,000 miles. These extensive plains equal in area that of Ohio, Indiana, Illinois, and Kentucky, and constitute the great agricultural resources of China. They now support an enormous population—fully 40% of China's total—and furnish food and raw materials for export.

Among the most extensively cultivated agricultural products of northern and central China are soya beans, rice, cotton, tea, silk, ground nuts, hemp, jute, castor oil, apricots, etc. Of farm products, eggs, egg albumin, feathers, etc., are exported in great quantities. Animal products such as furs, wool, skins and hides, goat skins, and bristles form a very important part of China's exports.

Mineral Resources

Generally speaking, there is a variety of mineral resources in most of the provinces of China and scientific surveys are almost sure to reveal mineral

deposits now unknown, even to the Chinese. The most abundant mineral deposits of the country consist of coal and iron. The largest coal area in northern China consists of Shan-si field, occupying the province of that name but extending into the neighboring provinces of Honan Chi-li, Shan-si, and Kan-su. This territory lies westward of the railroad line extending from Hankow to Peking. It has been estimated that in this field there were more than 30,000 square miles of coal. The coal of the eastern section is mainly anthracite, while that of the western part is bituminous. It is asserted by experts that there is sufficient fuel there to supply the whole world for thousands of years. The anthracite area is estimated to be larger than that of Pennsylvania. Near Peking there are several coal fields accessible to railroads and to sea transportation which are being extensively operated at present. To the south of Hankow is another important coal area located in the province of Kiang-si which is being mined now to supply the Government iron works established at Hankow.

Like coal, iron is widely distributed in China, and is often found closely associated with it. Honan, to the north, and Kiang-si, to the south of Hankow, are reported to be rich in iron ore. The most important iron plants are those of the Hanyehping Company, which are located at Hankow, and which produce approximately 150,000 tons of pig iron yearly. The extent and quality of the iron ore deposits of China are not definitely known. It is the opinion of many experts that the reserves of iron in China are quite similar to those of the United States and Brazil. Antimony also appears to be very abundant in Honan and Kiang-si, and there is considerable export trade of this metal.

Clay deposits are found quite extensively in the northeastern section of the province of Kiang-si and furnish material for the important pottery industry that has grown up there. Among other minerals mined in China are gold, silver, sulphur, asbestos, tin, lead, etc.

The Awakening of a Nation

China has occupied a place of more or less complete separation from the rest of the world. The mountain areas of the Northwest, West, and Southwest have impeded communication with peoples of those sections, while the great expanse of the seas has restricted the relations with the peoples across the water. Thus the Chinese, of all the large nations, have been allowed to live a life of isolation which, in certain respects, has led to stagnation, rather than growth of industry. But China is gradually awakening and is opening for the development of her immense resources, of which she has little definite knowledge.

A considerable portion of central and northern China has passed through the agricultural stage, and is ready to enter the industrial stage. The supply of cheap and industrious labor, a variety of natural resources, and sufficient food immediately available, constitute a remarkable combination of economic factors awaiting the touch of industrial and financial leadership.

ARRANGEMENT OF POWER CONDUCTORS

(Concrete recommendations for the spacing of power lines as made by the California Committee on Inductive Interference. Extremely technical mathematical calculations and six years of experimentation and study are back of this report, of which a portion of the results are here given. The entire report has been presented in its final form to the California Railroad Commission.—The Editor.)

The arrangement and spacing of the conductors of power circuits are of importance in determining (1) the unbalances or inequalities among the capacitances of the conductors to ground, which cause residual voltages and currents, and (2) the intensity of the inductive effects produced in communication circuits by the balanced voltages and currents of parallel power circuits. For sections of line within limits of parallels, consideration of the inductive effects should in general control rather than consideration of the capacitance unbalances. For sections of line outside the limits of parallels, consideration of capacitance unbalances should be given the greater weight, particularly for circuits operated without grounded neutrals.

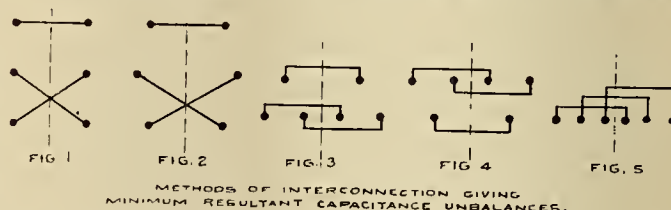
The figures and comparisons given herein apply to nontransposed circuits, but the comparisons of different configurations hold also for transposed circuits, provided the circuits are transposed identically. If there were no irregularities or inexactnesses to impair the effectiveness of a transposition system, it would be possible theoretically, neglecting the effect of phase change and attenuation, to obtain a perfect balance by means of transpositions, irrespective of the arrangement of the conductors. Practically, however, circuits even when carefully transposed have a material resultant unbalance, particularly at the frequencies of the higher harmonics, and this unbalance is proportional to the unbalance characteristic of the circuit configuration. In a similar manner the resultant induction due to a power circuit is proportional to the intensity of the induction characteristic of the configuration. Configurations differ widely in respect to their characteristic unbalances and intensities of induction, some arrangements, particularly of twin circuits, giving fully 90 per cent less unbalances or induction than others.

Effect on Capacitance Unbalance

In general, the capacitances to ground of the conductors of a non-transposed multiconductor circuit are unequal, the magnitude of the percentage unbalances being determined by, and therefore characteristic of, the configuration of the circuit. This "characteristic unbalance" is an important factor in determining the residual voltage of a circuit isolated from ground, and in determining the residual current of a grounded neutral circuit, in so far as such current is caused by the line itself. Taking as a measure of the characteristic unbalance, the residual voltage of a short, uniform, nontransposed circuit without metallic connection to ground and energized with unbalanced three-phase voltages between conductors, termed the "characteristic residual voltage," the following table affords a comparison of various configurations of single-circuit power lines over the practical range of cross-sectional dimensions.

Characteristic Configuration.	Residual Voltage; Per Cent of Balanced Three-Phase Voltage Between Conductors.
Equilateral triangle	0.5 to 4
Vertical	6 to 11
Horizontal—	
Symmetrical	5 to 9
Unsymmetrical	7 to 11
Isosceles triangle—	
Base horizontal	0 to 8
Base vertical	0.5 to 9
"L"	2 to 6
Inverted "L"	4 to 7

Triangular circuits have the smallest unbalances and characteristic residual voltages. Symmetrical horizontal and vertical circuits are about alike, the vertical having slightly the greater, and unsymmetrical horizontal circuits have the largest. The characteristic residual voltages of symmetrical horizontal and vertical configurations are from 2 to 8 times that of a corresponding equilateral triangular circuit, depending upon the spacing and height of the conductors. The characteristic residual voltages of unsymmetrical horizontal circuits are about 20 per cent greater than those of symmetrical horizontal circuits. They may, however, be reduced to those



of the symmetrical cases if the position of the intermediate conductor is alternated so that its average position is midway between the two outside conductors. (If the circuit is transposed this condition should be fulfilled in each section between transpositions.)

The characteristic residual voltages of equilateral triangular circuits are closely proportional to the conductor spacing, but the conductor spacing has but little effect in the cases of vertical and horizontal circuits.

With twin-circuit lines it is possible to connect the two circuits so that their unbalances tend to neutralize, giving smaller resultant unbalances among the capacitances of pairs of interconnected conductors than the unbalances among the conductors of individual circuits. For twin circuits of any type the maximum unbalances occur when conductors symmetrically located with respect to an intermediate vertical plane are at a common potential. This arrangement should be avoided in all cases.

For circuits of the vertical type, or with top and lowest conductors in a vertical plane and middle conductors displaced outward a small distance, the minimum resultant unbalances are obtained when the top conductors of the two circuits are at common potential and the middle and lowest conductors of one circuit are at the potentials of the lowest and middle conductors respectively of the other. (See

Figs. 1 and 2.) For triangular and horizontal circuits the minimum resultant unbalances are obtained when similarly placed conductors of each circuit are at common potential. (See Figs. 3, 4 and 5.) These figures are cross-sectional diagrams, the conductors at common potential being shown as interconnected.

The resultant unbalances with these arrangements are in some cases less than 10 per cent and in general less than 50 per cent of those with the worst condition described above. The arrangements indicated by Figs. 1, 2 and 3 give resultant unbalances of the order of magnitude of those of single-circuit equilateral triangular lines of corresponding conductor spacing, while those of Figs. 4 and 5, in general, give greater unbalances. In all cases the characteristic residual voltage is taken as the measure of the unbalance.

Where ground wires are used or in cases where unsymmetrical circuits or more than two circuits are involved, special study is necessary to determine the best arrangement.

With twin circuits of any configuration if the interconnection giving maximum unbalance be altered by transposing the interconnecting wires the unbalance is halved. The two possible interconnections resulting from this procedure are shown in Fig. 6. This plan is useful when there is a doubt as to the best arrangement.

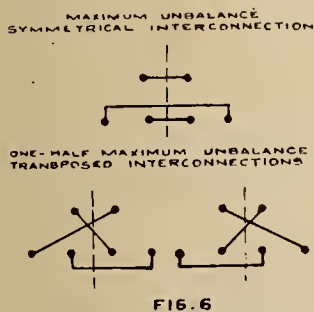


FIG. 6

To obtain the greatest advantage of arrangements giving small unbalances the twin circuits should be interconnected at both ends of the line and at intermediate substations where practicable. In cases where twin circuits are paralleled on the station side of transformer banks but can not be interconnected on the line side, it is still advantageous to fix the phase relation of the conductors as if they were to be interconnected for minimum unbalances.

When transposing twin-circuit lines to secure capacitance balance, the two circuits should be transposed at the same points and care should be taken to secure the condition for minimum unbalance in each section of line between transpositions. (See Fig. 9, below.)

The foregoing facts have an important bearing on the number of transpositions required to adequately balance different types of circuits, more frequent transpositions being necessary in circuits of large characteristic unbalances.

Effect of Induction from Balanced Voltages and Currents

The type of power circuit producing the least inductive effects in a parallel communication circuit depends upon the spacing of the conductors and the separation from the communication circuit. In general, for all types of circuit, an increase in the spacing of the power conductors causes a proportionate increase in the magnitude of the inductive effects. Excessive spacing should therefore be avoided. On

the other hand, ample spacing to prevent short-circuits or grounds, due to snow, wind, birds, etc., is essential from the standpoint of inductive interference, as well as from that of power service.

For lines separated by the width of an ordinary highway, a vertical type of power circuit, in general, causes the smallest inductive effects, while the horizontal types cause the greatest effects, the triangular types being intermediate in this respect. The relative merits of different configurations vary somewhat with the separation of the two classes of lines and with the dimensions of the power circuit, depending also upon the relative importance of the balanced voltages and currents in producing induction.

For low-voltage horizontal lines, 15,000 volts or less, a symmetrical arrangement of the conductors is better than an unsymmetrical arrangement. For lines of any voltage, if an unsymmetrical arrangement is used, the intermediate conductor should be displaced toward the communication circuit. Hence, unsymmetrical horizontal power circuits along highways should have the intermediate conductor placed on the side of the poles toward the road, where communication circuits are, or may be, located on the opposite side of the road.

When two or more synchronous circuits are carried on one line it is possible to interconnect the conductors of the two circuits or otherwise fix their phase relations so that a partial neutralization of the inductive effect takes place. For twin circuits of the vertical type, or with the top and lowest conductors in a vertical plane and the middle conductors dis-

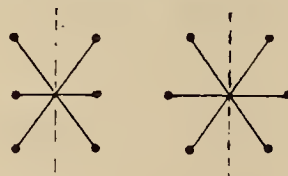


FIG. 7

FIG. 8

METHODS OF INTERCONNECTION CAUSING MINIMUM INDUCTIVE EFFECTS

placed outward a small distance, the most favorable condition is in general, to have the diagonally opposite conductors at a common potential. (See Figs. 7 and 8.)

For circuits of other types the most favorable method of connection varies with the spacing and height of the power conductors and with their position relative to the communication circuit. Thus it is not possible to give a general recommendation, since special study is required in each specific case to determine the most advantageous method of interconnection. Special study is also required for lines carrying more than two circuits of the same or different voltages, for unsymmetrical double-circuit lines, and in cases where ground wires are used.

In transposing twin-circuit lines to neutralize the inductive effects in parallel communication circuits, a similar precaution should be observed, as noted above, with respect to transpositions for capacitance balance. (See Fig. 9.)

Recommended Configurations

Taking into account both effects above discussed and practical considerations of construction, the equilateral triangular configuration (either the "horizontal-base" or "wishbone" type) is in general recommended for single-circuit power lines; and the vertical configuration (including type of construction

with middle conductors displaced slightly outward from vertical plane of the other two) for twin-circuit power lines.

The method of transposing twin vertical lines to preserve the best relation of interconnected conductors both outside and inside limits of parallels is

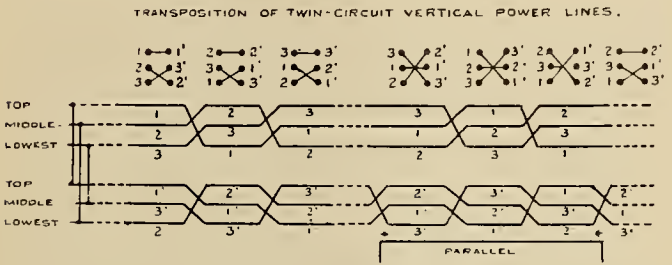


FIG. 9
* THESE TRANSPPOSITIONS IN CIRCUIT LAST INSTALLED OCCUR ONLY AT THE ENDS OF THE PARALLEL AND ARE FOR THE PURPOSE OF CHANGING FROM THE BEST ARRANGEMENT OUTSIDE THE LIMITS OF THE PARALLEL TO THE BEST ARRANGEMENT INSIDE THE LIMITS OF THE PARALLEL AND VICE VERSA

illustrated in Fig. 9, one barrel being shown in each location.

Reference

Further information concerning this subject will be found in Technical Reports Nos. 51, 64 and 65 of the Joint Committee on Inductive Interference. These and other technical reports are to be published by the State of California.

CHARTS FOR CALCULATING WATER HAMMER

(The latest of a series of fifty-two diagrams of practical use for the engineer and electrical man. The series includes: Bearing power of piles, direct current wiring, flow of water through pipes, canals in earth, stadia measurements, power loss in 3-phase transmission and a wide variety of other subjects. They have been prepared by Manifold & Poole, engineers of Riverside, and published by the Technical Publishing Company in handbook form. Mr. Poole will be recognized by readers of the Journal of Electricity as chief engineer of the Southern Sierras Power Company.—The Editor.)

The subject of water hammer is one of the most important in the design of pressure pipes, and yet in many cases is hardly taken into account, principally owing to the fact that engineers are not quite in accord as to the effects of the sudden closing of a valve, and also on account of the amount of labor required to apply the formulas.

Herewith we present two diagrams designed to lessen the labor of calculating the effect of water hammer, and thus to indicate suitable factors of safety in the design.

Diagram No. 50 gives the velocity of wave for steel pipes of varying diameters and thicknesses, and is based on the formula,

a = \frac{12}{\sqrt{\frac{W(1 + D)}{g(K + tE)}}}

where a = wave velocity in feet per second,
W = weight in pounds of a cubic foot of water.
g = acceleration due to gravity = 32.2 ft. per sec.
K = factor of compressibility of water.
D = inside diameter of pipe in inches.
t = thickness of pipe in inches.
E = modulus of elasticity of steel.

In order to obtain results from diagram No. 50, connect a line from diameter of pipe through the thickness and find intersection with a = wave velocity. It will be noted there is considerable variation in the wave velocity produced. In order that this may be a minimum, the efficiency of joint used should be as high as possible, as this will have the effect of making the plates thinner, and thus producing a slower wave. There is also a saving in the weight of the pipe, also the use of high tension steel would be indicated for same reasons.

Diagram 50 1/2 gives the maximum possible rise or fall in pressure due to water hammer, and solves the equation—

h = \frac{aV}{g} = \frac{48aQ}{D^2\pi}

where h = maximum pressure rise or fall.
a = velocity of wave as found in No. 50.
V = velocity of flow in pipe.
g = acceleration due to gravity.
Q = flow in second feet.
D = diameter of pipe in inches.

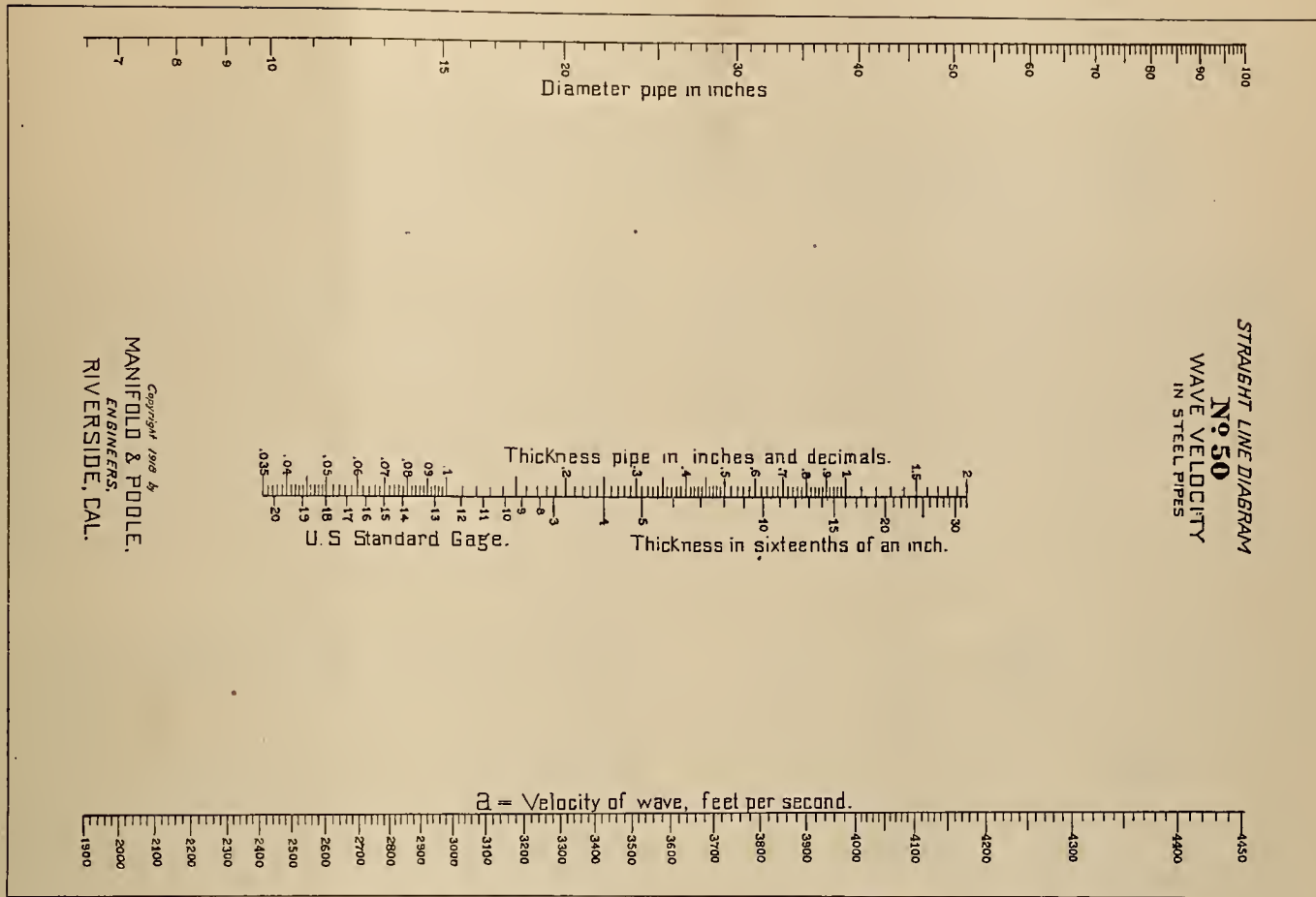
This diagram is divided into two parts, the left hand section giving the velocity in pipe for a given flow in Second Feet. The point thus found is then used in conjunction with the wave velocity in the right-hand section and where line crosses intermediate scale will be found the maximum pressure rise in pounds per square inch, or head in feet.

In looking over this diagram it will be seen how rapidly the maximum pressure increases with increase of velocity in the pipe.

In order that a pipe be designed safe, the factor of safety against water hammer should be such as to limit the maximum fibre stress in the steel to less than the elastic limit of the material. In the following table the method of figuring is shown. Assuming a diameter of pipe 48 inches to carry 60 second feet of water, Ultimate Tensile Strength of Steel 60,000 pounds, with an elastic limit of 50,000 pounds per sq. inch.

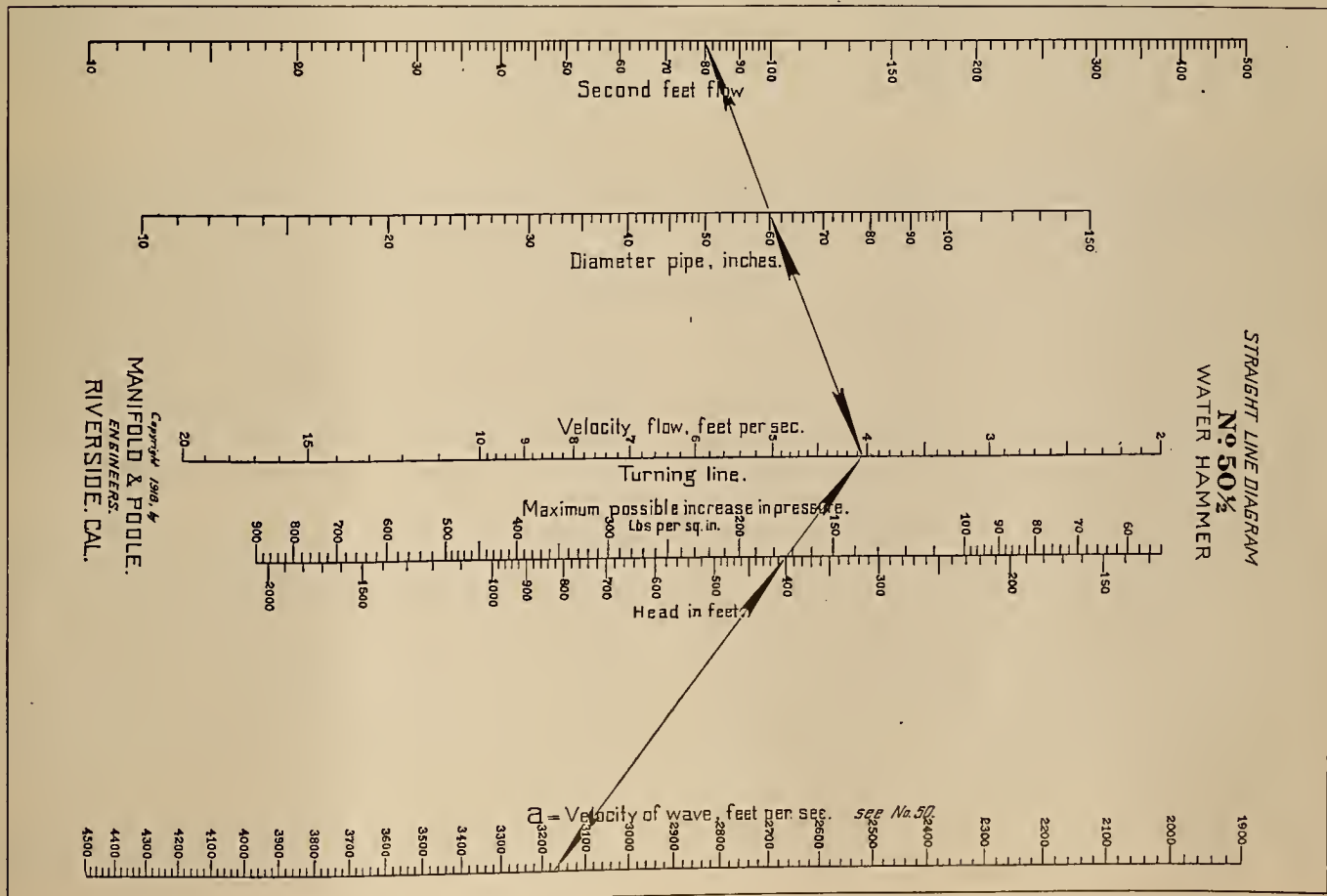
1—Eff. of joint.	2—Thickness of steel.	3—Wave velocity from No. 50.	4—Velocity of flow from No. 50 1/2.	5—Increased head from No. 50 1/2.	6—Head to stress to elastic limit.	7—Dif. cols. 5 and 6 static head at which to lay pipe.
70%	1/4"	2750	4.73	403	505	102
"	5/16"	2960	"	435	631	196
"	3/8"	3120	"	457	757	300
80%	3/8"	3120	"	457	866	409
"	7/16"	3240	"	475	1010	535
"	1/2"	3350	"	491	1155	664
"	9/16"	3440	"	505	1300	795
"	5/8"	3530	"	518	1445	927
"	11/16"	3600	"	529	1590	1061
"	3/4"	3660	"	535	1735	1200

It will thus be seen that while the greatest shock takes place at the lower end of a pressure pipe, the thinner sections of the pipe may be more dangerously stressed. The writer has in mind a pressure pipe where it was found necessary to install a relief pressure valve at a distance of over 4000 feet from the lower end, and in this position was entirely satisfactory. The installation of air chambers and relief valves at critical points on the line will be found of great advantage in reducing the effects of water hammer.



STRAIGHT LINE DIAGRAMS FOR USE IN CALCULATING THE EFFECT OF WATER HAMMER

The latest two diagrams recently added to the set of useful charts for engineering computations published by the Technical Publishing Company. The explanation of the method of use is to be found on the opposite page.



THE POWER PLANT AT THE MINE

BY ROSS B. MATEER

(The experiment of the power plant at the mine, in which Pennsylvania is the pioneer, is one which is of considerable interest to the West in view of the lignite mines soon to be made available. One such power plant is already tentatively planned in California and others may take advantage of the economy of the method at one time to relieve the transportation, fuel and power shortage.—The Editor.)

Steps in Fuel Conservation —

What is today a problem of national importance—conservation of fuel, had its inception some years ago, when the far-sighted managements of public utilities maintained efficient engineering organizations to solve the power problems of their consumers. Then by educational methods, isolated and inefficient

tem is linked with the other; as may also be noted in northern Illinois and in the New England states.

Yet with all the efforts of aggressive managements to provide for the rapidly increasing demands for power, not only by plant additions but by improved operating conditions, energy for industrial power purposes is not available in such quantities as are desired, in our larger centers of population. And with the advent of the reconstructive period, other demands for service will be noted in the sections which at the present time are only sparingly populated.

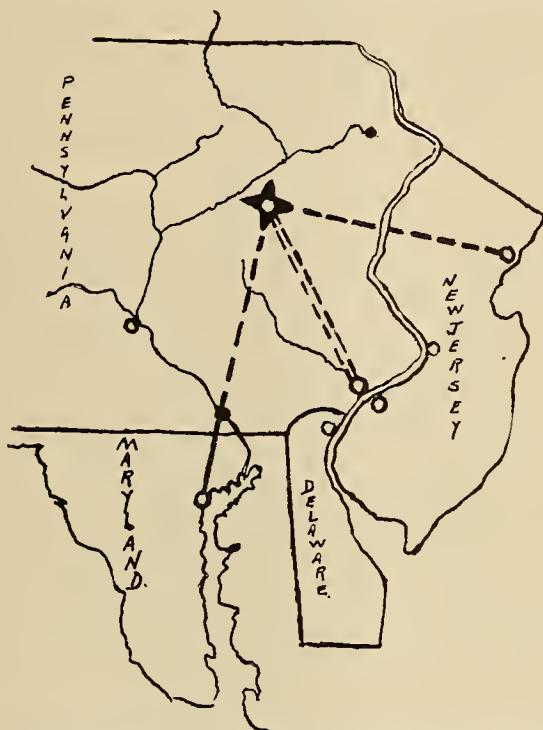
The Location of the New Plants —

How to provide for the rapidly increasing demands for power is a problem. Shall large sums of money be expended for tidewater steam plants or shall the problem be fairly faced and the new generating stations be located at the mine or waterfall, that our resources, coal, oil and water, may be utilized effectively and at a minimum of operating expense? In the West the answer to the problem has been sounded—and in large measure "white coal" will continue to generate in the high Sierras the energy which will turn the wheels of industry—not only at the ore mine but in the metropolitan coast centers. But what of the eastern states, and even in western districts where through this emergency, now passing, the generating capacity of mammoth steam plants has been sorely taxed?

The Plant at the Mine in Pennsylvania —

England has, I believe, contemplated the building of some sixteen large generating stations, interconnected, for the supplying of electrical energy to the United Kingdom of Great Britain, and estimated the economic saving to be \$600,000,000—with the cutting in two of the fuel requirements of industries now supplied with electric power. This is an incentive for the early construction of the pioneer plant-at-the-mine as is planned in Pennsylvania to supplement and supply the energy now delivered by the 427,000 kva. of generating machinery and 284 companies.

Consider, if you please, a certain group of utilities with 205,000 kva. now installed and with an approximate annual fuel tonnage of 274,096. Based on the 1915 average of .83 kw-hr. per pound of coal burned, the economy in freight charges alone at \$2.20 per ton would be \$603,011.00. This sum is exclusive of the saving possible by the elimination of the lost motion in rehandling the fuel at the terminal points. Again, consider that the 205,000 kva. installed supplies only two-thirds, based upon the statements of the Regional Director of the War Industries Board, of the total electrical energy required in Philadelphia, a city of 1,800,000 inhabitants. The



A proposed system for developing power at the mine in Pennsylvania. The line now in existence is indicated by a full line, the new development by dotted lines. This system of locating the plant at the mine means a great saving in actual expense as well as in the transportation facilities.

steam driven units were frowned upon and displaced with the flexible service supplied from the large central station.

Then, as now, much of the energy distributed to the varied industrial plants was generated in the larger centers of population and with either the "black diamond" or oil as a fuel. However, as this demand on the station increased the turbulent torrents of the mountain were harnessed and energy generated with "white coal" was carried, by long transmission lines over mountain range and through desert, to suitable switching stations and distributing centers. The utilization of the potential energy of the mountain stream was but a second step in the program of conservation. The third forward step was made when certain aggressive utility managements sought and obtained from public service commissions the right to interconnect their systems. One of the problems now under consideration in England American intelligence had already solved in California, where virtually every transmission sys-

remaining one-third now generated with steam equipment delivers only 0.44 kw-hr. pound of coal burned. An additional economy of \$142,498.00 in freight is apparent, were the energy to be transported in electrical form, or a total of \$745,509.00—which may be used to cover interest and all fixed charges incident to the construction and maintenance of a 100 mile, 120,000 kva. double tower transmission line at an expense of \$7,600,000.

Proportionate savings would obtain by the construction of two more tower lines—one of 105 miles to another large city, from which distributing center energy would be marketed by the Public Service Electric Company of New Jersey, and the other of 85 miles to McCalls Ferry—where the hydro-electric project now supplying energy to the city of Baltimore, Maryland, would be tied in with the reliable plant-at-the-mine. This means an additional investment of \$6,790,000, or a total investment of \$14,390,000 for transmission system only. This expense would be covered, from an investment standpoint, by the saving in fuel transportation charges of approximately \$1,550,065, yielding in excess of 7%, after reasonable allowance has been made for maintenance and repairs.

This is of course a large outlay to contemplate at a reconstructive period in our history—but are the lessons learned in the late emergency to be forgotten so easily? Common sense demands that reconstruction at home be considered as of equal importance, if not more so, than elsewhere, and especially when a reasonable return on the investment for permanent improvements—in this case high tension transmission lines—is assured by the elimination of transportation charges alone.

AUSTRALASIAN UNDEVELOPED WATER POWER

The London Electrical Review in a recent survey of water powers in the United Kingdom estimates the available supply in Australasia.

Australasia.—With the exception of New Zealand, the water power resources of Australasia have never been systematically surveyed.

Estimates have been made of a few of the more promising hydraulic powers of Tasmania. The Agent-general (Sir John McCall) estimates the possibilities at about 400,000 h.p. The State Government proposes to utilize the water of the King River in the near future to supply some 40,000 h.p. to the mining districts in the West. So far only three hydraulic installations have been developed. These are the Great Lake scheme, at present developing over 12,000 h.p.; the South Esk scheme, developing 1,350 h.p.; and the Lake Margäret scheme of the Mt. Lyell Mining Company, developing 4,000 h.p. The Great Lake, with a head of 1,120 ft., is capable of developing 70,000 h.p. The plant is now being enlarged. Part of the power is to be used for zinc reduction and calcium carbide production.

In view of the shortage of water powers in Australia, and of the future demand of the Commonwealth for nitrogen products, etc., there should be no difficulty in finding a market for the output of all

the energy which can be developed in Tasmania. Though comparable in area with the United States, there has yet been no notable hydroelectric development in Australia. The only possibilities of considerable powers are to be found in the rivers draining the Great Dividing Chain of the East Coast. Probably the possibilities of the Australian Alps lie between 300,000 and 500,000 h.p.

The Blue Mountains, to the west of Sydney, form an important high-level catchment; the available power is likely to be between 25,000 and 50,000 h.p.

The New England Range in New South Wales and Queensland has available power probably between 200,000 and 500,000 h.p. The State Government has outlined a power scheme for the river Clarence capable of producing 150,000 h.p.

In Queensland, Cairns District, the available horsepower probably lies between 150,000 and 400,000 h.p. The Barron River Falls would yield at least 10,000 h.p. This district is favored in respect of shipping facilities and is rich in copper, tin, and other minerals.

The aggregate power suggested as being capable of economic development in the Great Dividing Chain is from 625,000 to 1,300,000 h.p. In all cases the scheme would be somewhat expensive to develop, but in view of the general high cost of power in Australia, it would probably not be prohibitive.

New Guinea.—The physical characteristics of New Guinea offer exceptional facilities for developing water power. There are numerous rivers of large volume and steep gradient, and there is evidence that in the aggregate, the available power is enormous. German New Guinea, the territory occupied by the Australian forces during the present war, has also great prospects. Altogether the potential water power in the section of the island now under the British flag may amount to as much as 15,000,000 h.p.

The physical characteristics of New Zealand render the country particularly well adapted for providing large stores of water power, and for facilitating their development. The backbone of high mountains leads to heavy precipitation from the moist westerly winds, and the mountain ranges are studded with extensive lakes, situated above a deeply indented coast line, and support many glaciers of large size which act beneficially in equalizing the run-off throughout the year. A list of 72 important and promising schemes places the economically workable water powers of the Dominion at 3,700,000 b.h.p. on the turbine shafts. Of this, 500,000 h.p. is found in North Island and 3,200,000 in South Island. The power actually developed and in use in 1916 is given in the government returns as 42,600 b.h.p. Many other projects are, however, in course of construction or under consideration.

The outlook for New Zealand, at the dawn of what promises to be an era of unexpectedly great electrochemical and electrometallurgical activity, is most promising. As a center for the manufacture of nitrogen products, aluminum, calcium carbide and the like, its situation is ideal. The fundamental requirement, a great excess of energy over the power needs of the country, is provided.

THE NATIONAL ASPECT OF THE PUBLIC UTILITY

BY FRANKLIN T. GRIFFITH

(The question of higher street car fares is here discussed from the standpoint of what may legitimately be done to keep them low. It seems logical that the entire community should bear some of the burden, as it shares in the benefits, of transportation. What is being done by the companies themselves is further touched upon. The paper is one which was presented by the president of the Portland Railway, Light & Power Company at a luncheon of the Progressive Business Men's Club of Portland.—The Editor.)

During the last eighteen months fare increases of street railways have been granted in 274 cities of the United States. There are in the United States 158 cities having a population in excess of 40,000. Fare increases have been made in 90 of these cities and applications for increase are now pending in practically all of the remainder of them. A number of the larger cities in the country are now operating on a 7c fare. The largest cities in the state of New Jersey, including Newark and Jersey City, have a fare of 7c with 1c additional for transfer. In Pittsburgh a zone system has been established with a fare of 5c in the initial zone and 7c in the outer zone. A zone system with an initial fare of 6c and 2c per mile in addition thereto is operating in Milwaukee, Wis. Providence, Rhode Island, has a zone system based on 2c per mile. The elevated railways of Boston, Mass., are now being operated by a commission appointed by the state and a fare of 8c has been established since December first. More than two-thirds of the urban population of the United States is now paying 6c or more for street railway fares.

The necessity for increased rates of fare is due to two causes: first, the decreased purchasing power of money, and second, the improvement in working conditions of public service employes, coupled with increased wages. Throughout the country employes of public service companies are insisting that their working conditions and wages be placed on a comparable basis with the wages and working conditions of other industries and proper recognition of this demand has and will increase the cost of public service.

The situation of the public utilities is so serious that the National War Labor Board has in every case of granting increased wages called upon the regulating authorities to readjust fares so as to enable the company to pay the increased wages awarded.

The function of a street railway is to give adequate and convenient service at the lowest practicable cost consistent with reasonable wages and working conditions of the employes and with a reasonable return only upon the actual value of the property devoted to public service. A reasonable return upon the investment is to be determined by the rate at which money can be borrowed for public utility investment. Such rate is directly affected by the earning power of the utility. The more certain the utility is of maintaining a reasonable earning upon its investment the lower will be the rate at which it can borrow money necessary for its extensions. All public utilities are now strictly regulated by public service commissions with power to keep rates at such figures as will prevent unduly high earnings so that public service operation today has become

a question of determining the actual cost of the service given under efficient management and fixing rates for the service sufficient to pay the cost thereof. It naturally follows that all things tending to reduce the cost of service will directly affect the rates to be charged therefor and it is, therefore, to the advantage of all users of public utilities to reduce to a minimum or entirely eliminate all public charges imposed upon the utilities. Where a utility is owned by a municipality no public charges are imposed upon it and if it is proper to relieve a municipally owned utility from the payment of taxes and other public charges for the purpose of keeping down the rates charged the patrons of the utility, it is equally proper to relieve a privately owned utility from such taxes and public charges because such elimination of expenses does not inure to the benefit of the owners of the property, but under public regulation inure directly to the benefit of the utility's patrons.

Practically every street railway in the country and the municipalities in which they operate are now considering the solution of the problem on the basis of cost of service and it is hoped that some definite principles and systems will be devised and established before the industry as a whole sinks into utter ruin, toward which it is now rapidly progressing.

The utilities themselves should, and I believe are endeavoring in every possible way to keep down the cost of service by introduction of economies without impairment of service. One of the methods now being considered and in some instances adopted, is the use of the light weight safety car. This is a steel car having a seating capacity of 32 and operated by one man. It has been introduced in a number of cities on those lines of street railway not subjected to extraordinary congestion and is producing satisfactory results. The Emergency Fleet Corporation has purchased for and sold to the Portland company 25 such cars on term payments. These cars will reach Portland during the next few weeks and it is believed that their use on some of the lines will not only improve service, but also to some extent reduce costs. It is not deemed practicable to substitute the safety cars for more than a comparatively small proportion of the heavier cars now in use in any large city, but that they can be used to advantage on some of the lines of street railway in every city the authorities are fairly well agreed.

In Portland the wage increase of street railway employes exceeds \$1,000,000 per year over the wages paid in 1916 and the increase in operating expenses of the company as a whole is approximately \$2,000,000 per annum greater than it was two years ago. More than 80% of this increase in operating expenses is represented by increased wages.

SAVING THE WASTE IN THE CHIMNEY---III

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The determination of the actual draft required with the particular fuel in use in a given plant is a primary consideration in determining the height and regulation of the chimney. The very practical consideration of how to ascertain this element is here taken up in the third of a series of articles on chimney savings. To ascertain the draft required when oil is used as a fuel will be discussed in a later article.—The Editor.)

ACTUAL DRAFT REQUIRED FOR DIFFERENT FUELS

For every kind of fuel and rate of combustion there is a certain draft with which the best general results are obtained. A comparatively light draft is best with fire burning bituminous coals and the amount to use increases as the percentage of volatile matter diminishes and the fixed carbon increases, being highest for the small sizes of anthracites. Numerous other factors such as the thickness of fires, the percentage of ash and the air spaces in the grates bear directly on this question of the draft best suited to a given combustion rate. The effect of these factors can only be found by experiment. The following curves compiled by the Babcock and Wilcox Company are plotted from the records of numerous tests and allow a safe margin for economically burning coals of the kinds noted.

Boiler grates are usually proportioned so that the grate surface bears to the heating surface of the boiler a proportion suitable to the kind of fuel to be burned and the draft available. Thus if the boiler

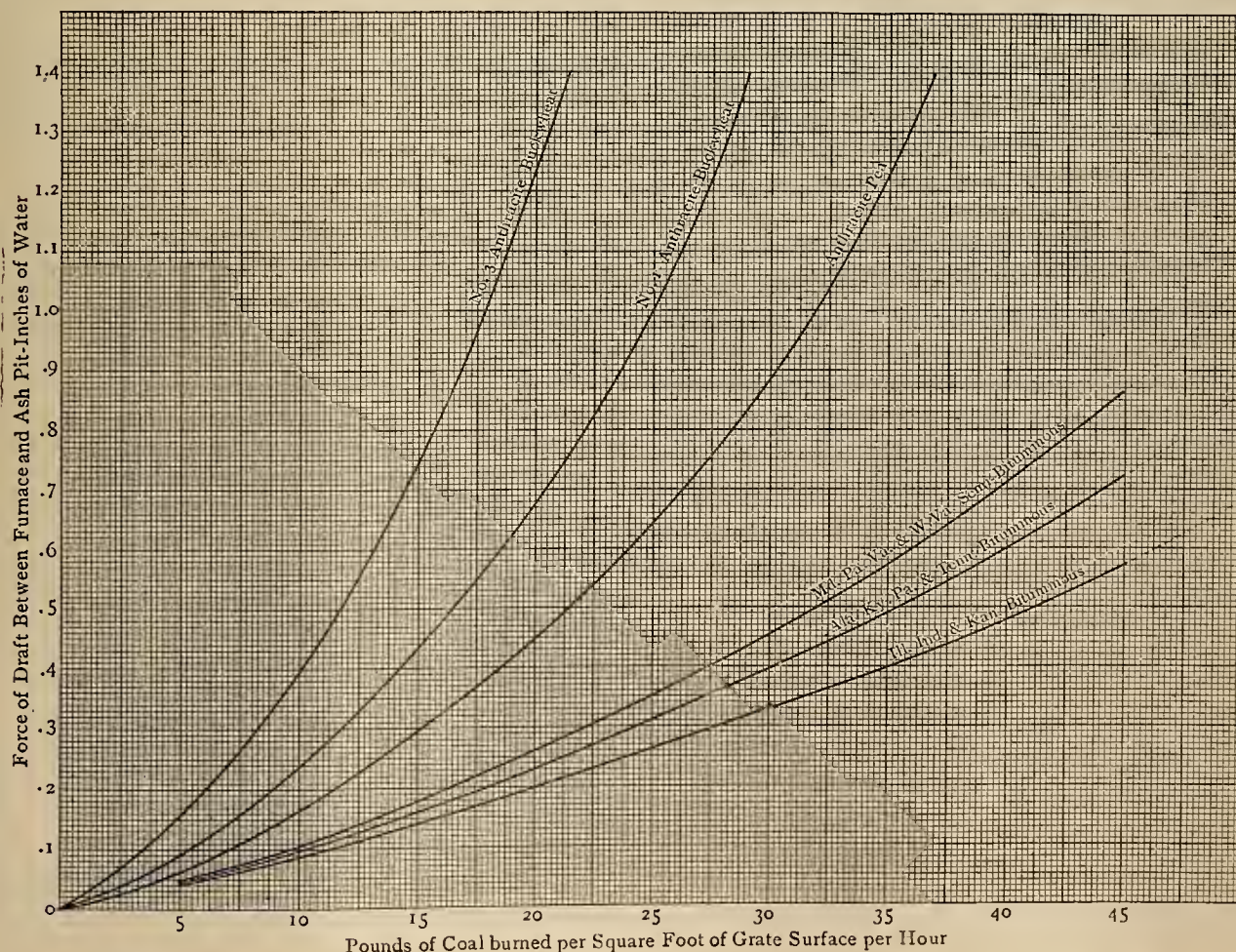
is to be fired by a good grade of bituminous coal, and is to be provided with ample draft, the ratio of grate surface to heat surface may be 1 : 65 or 1 : 70. If anthracite coal is to be used, or if the draft available is low, the grate surface must be increased and the ratio of grate surface to heating surface may be as low as 1 : 40 or in extreme cases 1 : 30. For average conditions, in which the boiler builder is not familiar with the fuel and draft conditions, it may be assumed that the ratio of grate surface to heating surface will be 1 : 50. The heating surface is designed according to the Builders' Rating which is that 10 sq. ft. of heating surface must be allowed for each boiler horsepower to be developed.

Thus we find that an average boiler installation of 2000 boiler horsepower has the following design:

$$\text{Heating surface} = 10 \times 2000 = 20000 \text{ sq. ft.}$$

$$\text{Grate surface} = \frac{20000}{50} = 400 \text{ sq. ft.}$$

Pounds of Coal.—A fuel is rated as to its ability to evaporate a given quantity of water from and at



A relationship of various kinds of coal burned per square foot of grate surface with the furnace draft required. This chart is from "Steam," published by Babcock & Wilcox Boiler Company.

212°F. per lb. of fuel burned. Since a boiler horsepower is equivalent to the evaporation of 34½ lb. of water from and at 212°F. per hour, we may compute the lb. of fuel required per hour thus:

$$\text{Total coal burned per hr.} = \frac{\text{Bl. hp.} \times 34\frac{1}{2}}{M} \quad (1)$$

in which M = lb. of water evaporated from and at 212°F. per lb. of fuel burned.

Thus Alabama bituminous coal evaporizes 8 lb. of water from and at 212°F. per lb. of fuel, therefore the fuel required per hour for a 2000 Bl. hp. installation is—

$$\text{fuel required} = \frac{2000 \times 34\frac{1}{2}}{8} = 8624 \text{ lb. per hr.}$$

Pounds of Fuel per sq. ft. of Grate Surface.—The pounds of fuel per sq. ft. of grate surface is now directly obtained by dividing the total fuel required per hr. by the grate area.

Thus if a 2000 h.p. boiler installation requires 8624 lb. of bituminous coal per hr. and its grate area is 400 sq. ft. the pounds of fuel per sq. ft. of grate

$$\text{surface} = \frac{8624}{400} = 22 \text{ lb.}$$

To Compute the Fuel Required for Overload Conditions.—An overload condition of 50% is usually allowed in computing draft for chimney design. For a 50% overload, it is found in practice that an additional 60% of fuel is necessary. Hence a boiler requiring 22 lb. of fuel per sq. ft. of grate surface per hr. will require 35 lb. for overload conditions.

To Read Furnace Draft from Chart.—Hence from the chart we now read the furnace draft required which for 35 lb. per sq. ft. of grate surface per hr. for bituminous coal is found to be .5 in. of draft.

Draft for High Overloads.—In special cases where a heavy load is required during a short period each day, such as the peak load of an electric light plant, boilers are designed so as to be capable of operating at 100% overload or even higher. In every case the draft apparatus must be designed for the maximum overload expected, as it is always possible to reduce the draft by means of the boiler damper to suit the lighter loads. In the present example, if 100% overload is expected the furnace must be capable of burning 50 lb. of bituminous coal per sq. ft. of grate surface per hour, which according to the chart would require a draft of .9 inch.

FUEL OIL PRODUCTION IN CALIFORNIA

(Men of the electrical industry throughout the West will be interested in reading this terse summary of the petroleum and natural gas production in California, as compiled by the California State Mining Bureau.—The Editor.)

The fact that the general public has not thoroughly recognized the stability of the California oil industry is no doubt due to a very considerable extent, to the fact that many large operators have had too limited a view of the value of their own oil land

assets. Men who have been successful in finding new oil fields frequently do not concern themselves with the later details of development. The idea has been too prevalent that profits must be quickly seized, regardless of the ultimate value of the property, and in many instances properties have been injured by careless operations. Some of the largest oil producers in the state have operated along such lines. This condition is clearly and definitely brought out by facts collected by the engineering staff of the State Mining Bureau during the past year in the testing of water shut-off at new wells. The average efficiency of the small concerns in this very important operation was 91 per cent while that of the large concerns was only 80 per cent. In fact, only one large scale operator, the Shell Company of California, showed results equaling or excelling the average figure for the small companies; and one of the very largest producers, the Standard Oil Company, actually showed an efficiency of only 71 per cent.

A comparison of the present ownership of proved oil lands with that of four years ago, still shows that there is no monopoly, although 65 per cent of the lands are held by only nine companies, and 72 per cent of the oil is produced by them. The land ownership and percentage of the total oil production by the larger concerns is shown in the following tabulation:

Operator.	% of total oil	Proved Land acres	Number wells
Associated Oil Company.....	9.1	7347	1048
Doheny (various companies).....	7.3	4286	379
General Petroleum Corporation.....	4.3	2584	400
Honolulu Consolidated Oil Co.....	1.3	2701	35
Atchison, Topeka & Santa Fe Ry. (oil subsidiaries)	4.0	3097	412
Shell Company of California.....	6.8	2442	236
Southern Pacific Co. (Fuel Oil Dept.)	8.5	18267	681
Standard Oil Company	22.6	8187	771
Union Oil Company of California.....	8.1	8198	427
All others	28.0	30171	3381
Total.....	100.0	87280	7770

The total oil production for the year 1918 will probably be about 100,000,000 bbl., which will exceed the figure for all past years except 1914. The total value of the oil at the wells will probably be \$123,000,000, an amount far in excess of any previous year.

In the early part of the year, it will be remembered that there were frequent panicky and pessimistic statements relative to decreasing stocks of oil, together with various special pleas for the removal of various government regulations and restrictions. The State Mining Bureau each week regularly furnishes the public, through the newspapers, with complete statements of oil field activity together with such general information as the facts justify. During the past year these statements have pointed out that production was increasing, or at least holding its own, in the fact of decreased field activity, and that decrease of stored oil was due to increased industrial activity. There is not an unlimited supply of oil, and industrial demands for power can not always be met with oil.

The spirit of cooperation, manifested by a majority of the oil operators, towards the protective and regulative work of the State Mining Bureau, indicates that in the next few years oil field operations will be brought to a high standard of efficiency.

SPARKS—Current Facts, Figures and Fancy

(An electrical fish stop which is being used in the Northwest to prevent fish from going up the wrong streams, an electrical means for extracting salt from the ocean which is being used in Norway, and an invention which claims to have greatly lengthened the life of the incandescent lamp are among the interesting items here recorded.—The Editor.)

The statute of "Electricity" on the top of the Telephone Building at 195 Broadway, New York City, is twenty-four feet high and weighs sixteen tons. It is 434 feet above the street level.

* * *

The bray has been taken out of the army mule, according to a contemporary, by a simple operation on its tail. It seems that if a mule cannot raise its tail it cannot bray, and so by simply cutting the muscles which perform the operation, the beast is silenced.

* * *

Electrical fish stops have recently been invented by an Oklahoma man, which are said to prevent fish from following wrong streams. The invention was demonstrated by the United States Bureau of Fisheries in the Northwest recently and was declared a success.

* * *

An electrical trap for tramps is said to be in use by the Southern Pacific Company. It is simply an ordinary box-car with an electrical device to indicate when hoboes enter, and an arrangement by which the door is closed and locked. The electric indicator is a "burglar mat," operated by a battery under the floor of the car.

* * *

The latest convenience for traffic policemen is to be found in Columbus, Ohio, where large red and white umbrellas labeled Stop and Go on their opposite faces are used, not only to direct traffic but to give shade for the policeman on a hot day. The policeman revolves the umbrella by means of a small handle, as in the ordinary semaphore.

* * *

According to an English paper, a telephone subscriber in Newark, England, asked his operator to ring his bell in three minutes, and immediately hung up his receiver. At the appointed time the supervisor rang on the line, and the subscriber responded merely with "Thank you." Later he called again to thank the operator, and explained that he had been boiling eggs and wanted to time them.

* * *

A substitute for radium for use on the dials of instruments on airplanes so that these instruments can be read at night, and for electric push buttons, has been made accessible by the Bureau of Mines in the mineral mesothorium which is extracted from monzanite sand, found in the Southwest. It is now largely made out of the waste products in the process of gas mantle manufacture and of thorium salts.

The successful methods of recovery worked out therefore represent an important mineral saving.

* * *

While iron is the only metal that can be made into a really powerful magnet, the property is not peculiar to iron. It has been discovered recently that silver can also be magnetized under certain circumstances. Some bars of exceptionally pure silver were heated to 130 deg. C. and left for some time in a strong magnetic field, in connection with some experiments on gravitational attraction, according to the London Electrical World. It was afterwards found that the silver had become weakly, but permanently, magnetized by this treatment.

* * *

A new multi-filament for an incandescent lamp has been devised by a Los Angeles inventor which is said to provide 12 filaments each of 25 candle power. Four are lighted when the lamp is turned on, and the next four are automatically brought into circuit whenever a filament fails. In this way the life of a lamp is considerably prolonged. Thus, if the average life of a filament is assumed to be 1,000 hours, the lamp would still be giving 100 candle-power after 2,000 hours, and can be used with diminished candle-power until the last filament gives way.

* * *

Experiments in Norway with a view to extracting salt from ocean water by means of electricity have been successful and two salt factories are to be started for this purpose in the near future. One is to be in the western and the other in northern Norway, as these districts, on account of the fisheries, are the best home markets. Besides the salt, different by-products will be made. During the war it has been difficult to get salt from abroad and sometimes it has been impossible to salt down the fish. The new salt works should greatly improve the situation.

* * *

An invention which has taken the "static" out of wireless telegraphy, removing thereby the greatest obstacle to the clear transmission of radio messages, is said to have been perfected by the chief engineer of the Marconi Wireless Telegraph Company. The invention not only makes possible the sending of clear radio messages regardless of atmospheric conditions, but also does away with the necessity of constructing huge wireless towers. Perfect service, it is reported, can be obtained with the use of antennae extending only a few feet from the ground.

PERSONALS

James C. Clark, assistant professor of electrical engineering at Stanford University, is filling with unusual credit the chairmanship of the San Francisco Section of the American Institute of Electrical Engineers. The section has immediately ahead some meetings of great current interest. On January 24, 1919, will be held a joint meeting of local sections of five national engineering societies, over which Professor Clark will preside, as the meeting is to be held under the auspices of the Institute. The subject for the evening will



be a symposium on reconstruction problems which will deal with matters of intense interest to the engineering profession as a whole and will be treated by men of national engineering reputation. On February 7, 1919, the meeting of the local section will deal with unification of telephone systems at which time Daniel E. Wiseman, equipment engineer for the Pacific Telephone & Telegraph Company, who has so ably solved this problem in Los Angeles which proved vexing for so many years, will deliver a paper setting forth the method of solution in Los Angeles. In addition to these interesting meetings, a weekly informal luncheon of the Institute membership is held at the San Francisco Engineers' Club on each Friday. Summing up the situation as a whole, the Institute activities in and about the San Francisco bay region are in an unusually healthy condition.

W. G. Vincent, valuation engineer for the Pacific Gas & Electric Company, is recovering from a severe attack of the Spanish influenza.

E. O. Shreve, San Francisco manager of the General Electric Company, has recovered from a severe attack of the Spanish influenza.

Barry Dibble, project manager of the Minadoka Project of the U. S. Reclamation Service with headquarters at Rupert, Idaho, is a recent San Francisco visitor.

Ralph A. Gibson is now Chief Engineer of Plant of the G. E. Standifer Construction Corporation, shipbuilding company across the river at Vancouver, Washington.

C. R. Hunt, San Francisco manager of Robbins & Myers Company of Springfield, Ohio, has returned to San Francisco after a business trip to the East covering several weeks.

C. H. Purcell, formerly Bridge Engineer with the State Highway Commission, is Senior Highway Bridge Engineer, Federal Office of Roads, with headquarters at Portland.

A. A. Miller, manager railway and power divisions of the Seattle office of the Westinghouse Electric & Manufacturing Company, visited Portland and Spokane in December.

Samuel Kahn, general manager of the Western States Gas & Electric Company and president of the Pacific Coast Section, N. E. L. A., has been confined to his home with a severe attack of influenza.

R. F. Behan, assistant to the San Francisco manager of the Westinghouse Electric & Manufacturing Company, has severed his connection with the company. Mr. Behan's new business connections are as yet unannounced.

E. B. Strong, president of the Technical Publishing Company, publishers of the Journal of Electricity, is in the

East where he will remain for some months, visiting practically all of the large eastern industrial centers in the interest of the Journal of Electricity.

S. P. Russell has resigned as manager of the electrical department of H. W. Johns-Manville Company at San Francisco and has purchased an interest in the firm of H. B. Squires Company, Manufacturers' Agent at San Francisco, with which concern he is now associated.

F. A. Gerhart will in future represent the Crouse-Hinds Company on the Pacific Coast with headquarters in San Francisco. Mr. Gerhart succeeds Geo. A. Gray who resigned his position with the Crouse-Hinds Company in order to establish a manufacturers' agency on the Pacific Coast.

Geo. A. Gray has resigned as sales engineer on the Pacific Coast for Crouse-Hinds Company, after nine years' service. He has opened offices as "business builder" for manufacturers in the Sheldon Building, San Francisco, and is open for engagement as sales representative of several electrical manufacturers.

E. O. Edgerton has been reelected as president of the California Railroad Commission. The commission is now composed of five members, as follows: E. O. Edgerton, Harley W. Brundidge, Irving J. Martin, F. R. Devlin and H. D. Loveland.

Franklin T. Griffith, president of the Portland Railway Light & Power Company, has been elected president of the Arlington Club of Portland, Oregon, and with the determination to be led by an electrical man in any case, Guy W. Talbot, president of the Pacific Power & Light Company, was chosen to hold the position of first vice-president.

R. Boan, engineer of tests, E. W. Arthur, assistant manager, and F. J. Shea of the mechanical branch of the Victoria Government Railways of Melbourne, Australia, have returned to their home city after spending several months in this country and in Canada, investigating railway conditions and other matters of interest pertaining to the electrical industry.

C. E. Grunsky, a consulting engineer of San Francisco and well known to readers of the Journal of Electricity as the author of a valuable and helpful series of articles on rate fixing published in its columns during recent months, has been elected a director of the American Society of Civil Engineers and is now in New York, attending the annual meeting of the society.

E. A. Rogers, formerly with the steam power department of the Pacific Gas & Electric Company and later efficiency engineer for the Palace Hotel Company, has left San Francisco to become chief engineer of steam power generation for the Cornelia Copper Company with headquarters at Ajo, Arizona. This splendid new power plant, erected by Chas. C. Moore & Company, is said to possess one of the most remarkable efficiencies ever produced under fuel oil operation.

M. C. M. Hatch, a well-known mechanical engineer of New York City who is with the Locomotive Pulverized Fuel

Company, has been spending several weeks at various Pacific Coast centers. Mr. Hatch, as a member of the American Society of Mechanical Engineers, has presented a number of helpful papers before various sections of the Society on the subject of pulverized fuel, of which subject he has been a close student for several years. The need for fuel substitutes in the West has made the subject of powdered coal and the possible use of lignite deposits throughout the West of unusual interest.



Chas. Frank Stern, formerly a member of the California State Highway Commission, where he rendered excellent service to the state in aiding the construction of California's justly renowned system of highways, has been appointed State Superintendent of Banks. While the attractive salary attached to the new position, consisting of ten thousand dollars per annum, is sufficient in itself to give the new appointee much publicity throughout the West, the Journal of Electricity views the advent of Mr. Stern into banking

circles of the West from an entirely different light. Mr. Stern comes to the new office in the prime of a young manhood that speaks with such eloquence to all his audiences that it is confidently believed the financial status of this commonwealth will be forwarded under his direction and a stronger footing for public utility growth established, since the financing of our western securities is so closely interwoven with the stability of our banking institutions.

C. H. Delany, steam power plant specialist of the Pacific Gas & Electric Company, San Francisco, and joint author of a recent book on "Elements of Fuel Oil and Steam Engineering," is spending a week in Seattle, to investigate the use of powdered fuel in that vicinity.

C. W. Koiner, general manager and electrical engineer of Pasadena's Light and Power Works, has returned to his regular duties at Pasadena, California, after serving for a period in war work, having served with the engineering section, power department, of the United States Shipping Board, Emergency Fleet Corporation, looking after technical work and general power problems.

J. A. Wells of the service department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, has established headquarters at Ellensburg, Washington, while engaged as inspecting engineer for that part of the equipment being furnished by the company to the Chicago, Milwaukee & St. Paul Railway for the Cascade electrification. Mr. Wells recently arrived and will be on the job for some months.

C. F. Vanbergen, engineer for the Holland Concrete Company at Java, Holland, is in Portland on a study tour which he is making of engineering works throughout this country. Mr. Vanbergen has been in America but a week and a half and expects to spend about three months visiting the big construction projects. Mr. Vanbergen's company is building a number of harbors in India and he is especially interested in that phase of engineering work.

H. N. Sessions, the able and efficient engineer for the Southern California Edison Company, although swamped with duties of office and calls upon his time for various national drives, in addition to sickness in his home, still has found time to gather together data regarding the remarkable work done by his company in salvaging the waste material and the consequent effect upon the company organization in such a campaign of thrift. This interesting and helpful data will appear in the Journal of Electricity, February 1, 1919.

Captain F. E. Pernot, now on special research with the Bureau of Standards at Washington, who formerly was assistant professor of electrical engineering at the University of California, is about to publish a book entitled "Logarithms of Hyperbolic Functions to Twelve Significant Figures." The book will be under joint authorship with Dr. B. M. Woods, assistant professor of mathematics at the University of California. The authors are now finally checking their calculations which are already in print at the University of Califor-

nia Press in Berkeley. The book should prove unusually helpful for long distance transmission computations.

J. B. Black, salesmanager for the Great Western Power Company with headquarters in San Francisco, in company with Messrs. Woodward and Heroux, manager and superintendent of the East Bay division of the company, has made a recent interesting inspection of the new industrial activities near Martinez, California. Men of the industry will be surprised and greatly pleased to note the vast new industrial activity of this growing district. Among the plants visited were: Shell Company, Butters Zinc Reduction Works, Cowell Cement, Port Costa Water, Pacific Coast Shipyards, C. A. Smith Lumber Mills, Pacific Electric Metals, F. E. Booth Packing Houses, Lanteri Shipyards, Pittsburg Chemical Works, Bowers Rubber Plant, Great Western Chemical, Port Costa Brick, and returning via Brentwood, where the trio were received by the management of the East Contra Costa Irrigation Company.

James M. Wadsworth, who did such effective work as administrative engineer of the Federal Fuel Administration for California, has left for Bartlesville, Oklahoma, to become assistant chief engineer of the Empire Gas & Fuel Company. While Mr. Wadsworth thus leaves active governmental work he still retains his title as consulting engineer for the Petro-

leum Department of the Bureau of Mines. Two departments of the Federal Fuel Administration ceased operations at the first of the year. They are the bureau of the administrative engineer, J. M. Wadsworth, and the Conservation Bureau, presided over by Walter Samson. The price fixing program of the Fuel Administration will continue for the time being, but at the signing of peace the entire Fuel Administration will

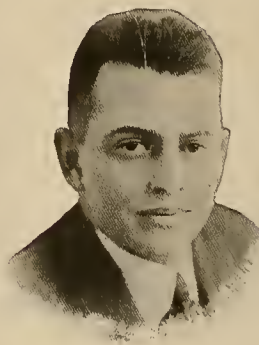
withdraw. The oil division of the Federal Fuel Administration for the Pacific Coast is closing its offices. D. M. Folsom, chief of the division, will not present his resignation for some time, however, while there is need for his services with the Petroleum War Service Committee, which is in charge of tankers on the Pacific Coast.

OBITUARY

Jacob Bard, chief engineer of the Sangamo Electric Company and one of the leading electrical meter engineers of the country, died on December 13th, 1918, at his home in Springfield, Illinois, from pneumonia. Graduating from the University of Illinois in 1906 and after a few years' work divided between the Western Electric Company and the Peoria Gas & Electric Company, Mr. Bard entered the employ of the Sangamo Company in 1911, rapidly rising to have charge of all engineering matters, including development work for that company. Mr. Bard was a member of the American Institute of Electrical Engineers. He leaves a widow and one son.

Alfred Statley, manager of the local telephone exchange at Independence, Ore., died recently from pneumonia following influenza. Mr. Statley had been manager for two years. He was formerly in the employ of the Home Telephone Company in Portland. He is survived by his wife, who lives at Independence, and other relatives in St. Louis, Mo.

Douglas W. Taylor, for fourteen years at intervals city engineer of Portland, Ore., died recently from pneumonia, following influenza. At one time Mr. Taylor was surveyor-general for Oregon and in 1891 served as city superintendent of streets.



MEETING NOTICES FOR ELECTRICAL MEN

(The New Year has been marked in many of the western electrical organizations by the election of officers, the results of which are given below. Particular activity is reported from the Northwest where an irrigation and drainage congress has taken up matters of land settlement and irrigation legislation.—The Editor.)

San Francisco Electrical Contractors and Dealers

Thirty members and guests of the Electrical Contractors and Dealers' Association assembled for an "old year's" luncheon at a local cafe on December 28th. The first and only order of business was the election of officers for the ensuing year, as follows:

President, C. L. Chamblin
Vice-President, W. D. Kohlwey
Secretary, J. Stewart
Treasurer, Frank Watts
Conference Committee: C. F. Butte, T. J. Bennett, J. M. Carlson.

Executive Committee:
H. C. Reid
C. B. Kenny
J. Hetty

Therafter a free expression of ideas was given by the members, several representatives of the inspection departments and the electrical press. The meeting did not adjourn till late in the afternoon and all present agreed that it was the pleasantest of these annual affairs yet held.

Local Sections A. I. E. E. and N. E. L. A., Portland, Oregon

A regular meeting of the Portland local sections of the A. I. E. E. and N. E. L. A. was held at 8 p.m. at the Multnomah Hotel, Portland, Oregon, Jan. 7th, 1919. Prof. W. C. Morgan of Reed College was the speaker of the evening, his subject being "The Chemistry of the War." The talk was followed by an informal dance and buffet lunch for the members and their ladies.

Northwest Society of Highway Engineers

This association held its annual meeting and election of officers Jan 11, 1919, at 6 p.m. at the Portland Hotel, Portland, Oregon. The regular meeting was preceded by a business meeting at 4 p.m. and a banquet, after which Prof. Warren D. Smith of the University of Oregon read a paper on the "Importance of Geology to the Engineer."

M. O. Bennett of Pendleton, Oregon, and H. E. Abry of St. Helens, Oregon, led the discussion on the prepared legislative bills to be brought before the Oregon Legislature this spring. Two of the most important bills to be presented are the bills requiring professional engineers to be licensed and to abolish the position of road masters and provide for the appointment of county engineers. A fine musical program rendered during the banquet formed a pleasant feature of the gathering.

The former officers of the association are: Herbert Nunn, president, O. Laurengard, director, and G. R. McCleod, acting secretary, Salem, Oregon.

Spokane Engineers

The Spokane chapter of the American Society of Civil

Engineers, at a luncheon given at the University Club in that city on December 13th, elected the following officers: President, H. G. Doolittle; vice-presidents, C. A. Burnette and E. G. Tabor; secretary-treasurer, Charles Davis. Captain T. H. Judd, of Pullman, five years ago associated with President Doolittle in the state highway department, was a guest at the luncheon. He recently returned from overseas and wears a wound stripe and another for six months' service overseas.

Annual Meeting of Seattle Engineers' Club

The annual election of the Engineers' Club, Seattle, was held on January 10th, the polls closing at 12 o'clock noon.

The following officers have been chosen: President, H. E. Horrocks; vice-president, L. M. Grant; secretary, E. J. Bartells; treasurer, A. M. S. Statler; executive board, J. E. Pinson, Stuart Mannell and R. S. Drury. The annual meeting of the club was held Saturday night, Jan. 11th, in the club rooms, and reports from the entertainment committee indicate a large attendance.

Irrigation Institute Convention

The Washington Irrigation Institute held its sixth annual convention at Yakima on December 17 and 18, 1918. President Elbert M. Chandler in his annual address carefully outlined the work of the institute, emphasizing the increasing importance of irrigation.

The institute endorsed the land settlement plan outlined by Secretary of the Interior Franklin K. Lane to obtain homes for returned soldiers and bring about a healthy rural community life.

An important resolution recommended to the legislature is the passage of an act amending the present irrigation code to provide that no indebtedness shall be incurred by any irrigation district within the state until the plan of irrigation proposed by said irrigation district shall have been approved by the state hydraulic engineer and a permit issued by him therefor. The chairman of the proposed state land settlement board, the state engineer and state commissioner of agriculture shall constitute a board to be known as the irrigation district, until the project shall have been approved by the state hydraulic engineer and the securities secured thereby are approved by the said commission. It was also recommended that the irrigation district bonds be added to the class of securities in which the permanent school fund may be invested after being passed upon by the irrigation district board commissioners.

The institute adopted resolutions indorsing 12 proposed

BUILDERS OF THE WEST—XLV



C. D. MARX

To have been professor of civil engineering for many years in a great university, to have been president of the American Society of Civil Engineers, and lately to have risen to the acting presidency of Stanford University are indeed outward indications of the technical worth of an engineer as a builder of the West. But to that large group of engineers who have been touched by his gentle, helpful presence, the real qualities of the builder are best shown in the affectionate title by which he is known to those who have learned to appreciate the helpful presence of "Daddy" Marx. And so to "Daddy" Marx, as a Builder of the West, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his method of instilling hope, courage, and constructive imagination in the hearts of countless engineers of the West.

amendments to the proposed irrigation district law, as follows:

- 1—That provision be made for the combination of irrigation districts.
- 2—That provision be made for a larger number of directors in large districts.
- 3—That provision be made for the handling of all drainage matter in all irrigation districts by the board of directors, and for incorporating in irrigation districts now organized all drainage districts within the boundaries of such irrigation districts.
- 4—That provision be made for the acquisition of rights of way for districts similar to that now used by drainage districts.
- 5—That irrigation districts be allowed to provide for the delivery of domestic water in separate supply, and for the development of hydroelectric energy in connection with the irrigation district, the lease or sale thereof for corporate use, either private or public.
- 6—That the board of directors of irrigation districts be authorized to employ irrigation specialists.
- 7—That some provision be made for the change of due dates in bonds, subject to a vote of the water users of any district, maturing the same in less than twenty years where desired.
- 8—That amendment to the present method of levying assessments be made in order that the time be extended for the preparation of the assessment roll and providing for a rate of assessment prior to the hearing by the board of directors for the correction of said assessment roll.
- 9—Amendment to the district law in order to avoid unnecessary cost of publication of delinquency lists.

10—To provide for proper working funds within the district to avoid delays and inconveniences in the employment of labor now imposed by the system of payment by warrant through the county treasurer's office.

11—Amendment of local improvement district act to provide for the enlargement of existing local improvement districts, to provide for a longer time of payment, 15 or more years being allowed where the cost per acre warrants it.

12—To provide for delinquent tracts paying costs of collecting from such tracts.

After the adoption of the resolutions many of the members enjoyed a formal banquet at the Commercial Hotel, at which Col. Howard A. Hanson of Seattle acted as toastmaster owing to the illness of Duncan Dunn of Wapato, who was to have acted in that capacity.

President Chandler appointed a new standing committee on legislation composed of Ralph Williamson, Yakima; George T. Crane, Brewster; H. E. McGregor, Prosser; Judge Ralph Kauffman, Ellensburg; Prof. O. L. Waller, Pullman; R. K. Tiffany, Yakima; E. F. Benson, Olympia, and H. M. Gilbert, Yakima.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—J. H. Cunningham, Southern California Edison Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 503 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section

Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

Chairman—Albert S. Anderson, Boulder.
Secretary—Terril C. Smith, University of Colorado, Boulder.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hoppold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—C. H. Suydam, Stanford University.
Secretary—Frank Miller, Stanford University.

Montana State College Branch

Chairman—Roy C. Hagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 110 West 4th St., New York.
Executive Committeemen-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jagger, Portland.

British Columbia Ass'n Electrical Contractors and Dealers

President—E. Brettell, Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—M. A. DeLew, 180 Jessie St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—C. L. Chamblin, 641 Mission St., San Francisco.
Secretary—J. Stewart, San Francisco.
Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—R. C. Kenney, Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggrr-Sroufe Co., Portland.

Sacramento Section, California Electrical Contractors & Dealers' Association

President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

- Electrical Supply Jobbers Association**
General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.
- Pacific Coast Electrical Supply Jobbers**
President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.
- Electrical Credit Ass'n of the Pacific Coast**
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

- California Electrical Cooperative Campaign**
Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
- National Electric Light Association**
President—W. F. Wells, Edison Elec. Illuminating Co., Brooklyn.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
- Nevada Section, N. E. L. A.**
Chairman—Geo. A. Campbell, Reno, Nev.
- Pacific Coast Section, N. E. L. A.**
President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
- Portland Section, N. E. L. A.**
Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.
Secretary—F. H. Murphy.
- Illuminating Engineering Society**
President—George A. Hoadley.
Secretary—Clarence L. Law.
Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
Meetings—First Tuesday each month.
- New Mexico Electrical Association**
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.
- Southwestern Electric and Gas Association**
President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
- Northwest Electric Light and Power Ass'n**
President—L. B. Faulkner, Olympia Light & Power Co., Olympia, Wash.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.

Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
New officers announced later.

Los Angeles Jovian Electrical League
President—A. E. Peat, San Joaquin Light & Power Corp.
Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—Garnett Young, 612 Howard St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furness, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—H. N. Beecher, City Hall, L. A.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—W. H. Brammance, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dodson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

- National Officers**
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.
- San Francisco Section, A. S. M. E.**
President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.
- Los Angeles Section, A. S. M. E.**
President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

- Oregon Society of Engineers**
President—Orrin E. Stanley, Box 973, Portland, Ore.

Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.

Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—A. E. Chandler, New Call Bldg., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

MISCELLANEOUS

- American Ass'n for the Advancement of Science—Pacific Division**
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.
- Portland Section A. S. C. E.**
President—P. H. Dater, Eng. U. S. Forestry Service.
Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
Meetings—At call of president.
- Spokane Engineering & Technical Ass'n**
President—J. C. Ralston, E. M., E. E.
- Foreign Trade Club**
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
- Pacific Coast Gas Association**
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
- Society for Promotion of Engineering Education**
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

TRADE NOTES

New Building—

The Washington Electric Supply Company is now located in its new five-story building at S. 152 Monroe, Spokane, Wash., which it recently purchased, consolidating in this location the office and retail store formerly at 907 Riverside Avenue and the warehouses formerly on the Spokane International Tracks.

This building is of slow burning material construction, directly located on the Northern Pacific tracks with facilities for loading and unloading carload shipments direct to the warehouse platform. Commodious and well arranged offices have been established on the ground floor and the remainder of the building is devoted to warehousing a complete stock of electrical merchandise. The situation is very convenient, being close to the center of the city and only two blocks from the Davenport Hotel.

Company Convention—

The Doherty organization held a recent convention in New York City on Dec. 9th to 12th at which two hundred executives from their various branches were represented. Conditions and activities were reported from each company and general problems of the organizations as brought for-

ward by peace conditions were discussed and policies agreed upon.

Returned from London—

Lieutenant-Colonel H. M. Byllesby returned from overseas duties with the American Expeditionary Forces, arriving on the Caronia Tuesday, December 17th. Since early in the year he served as London representative of the Purchasing Board for the United States army in Europe. He has received his honorable discharge from the army and will rejoin H. M. Byllesby & Company.

A Record Shipment—

Sangamo Electric Company recently broke the record for a carload shipment of meters and meter posts by shipping 5,107 meters complete and 500 transformers, totaling 86,000 lbs. in a single car. Most of this shipment went to Argentine and Uruguay.

A 1919 Calendar—

The Youngstown Sheet and Tube Company has recently sent out a most attractive calendar for the year 1919 with an accompanying letter in the spirit of the times:

Permit us to hand you our calendar for 1919, with the hope that it may cover a year filled for you with all good things.

The World War has been won by the forces of right and justice. The problems it has created will soon be solved. Turning from tasks of

war, we shall win new victories in the arts of peace. The future will bring to all of us adequate compensation for sacrifices made in the greatest cause humanity has ever known.

For ourselves, we rejoice in the opportunity to again serve our good customers without hindrance and with facilities greatly increased by extensions made during the war in an effort to render utmost service to the nation.

Yours truly,

THE YOUNGSTOWN SHEET & TUBE COMPANY.

New Electric Heater —

Arthur & Fowler, Ritzville, Washington, are engaged in the manufacture of electric heaters. The heater was invented by Guy Arthur and Paul Fowler and is designed for heating water tanks for domestic purposes. The heater goes around the base of the tank. The electric current is kept on steadily in most cases and the water kept very hot at all hours.

Machine Plant Sold —

The Colby Engineering Company, of Portland, has completed the purchase of the Auto-Marine Machine Works and the structural steel plant of the West Steel Company, in Tacoma, and will operate them hereafter under the name of the Colby Steel Engineering Company. Headquarters of the concern will be moved from Portland to Tacoma.

Lalley Agency —

Riegel Brothers, distributors of Dodge automobiles and trucks, Spokane, have taken the agency for the Lalley electric light and power plant designed for furnishing light and power on the farm. The plant consists of a small, compact electric generator, directly driven by a gasoline engine, and a set of storage batteries of 115 ampere-hour capacity.

A Sales Dinner —

Following a sales conference, at San Francisco, of the entire sales force, The Electric Appliance Company tendered a dinner to their employees on the evening of Dec. 31 at the Commercial Club. This is an annual affair given by the company to its staff and usually takes place between Christmas and New Year's. The dinner of this year proved a particularly pleasant occasion and was enjoyed by more than fifty members of the organization.

Personal Items —

T. N. Slocum, previously with the Federal Sign Company, has joined the forces of the Pacific States Electric Company with offices at 570 First avenue South, Seattle.

H. J. Woodward, until recently with the Economy Fuse & Manufacturing Company, Henry Building, Seattle, has joined the Seattle forces of the Fobes Supply Company.

S. W. Barker, formerly with the National Carbon Company at San Francisco, has succeeded the late J. W. Leighton as representative of the company with offices at 421 L. C. Smith Building, Seattle.

Clarence P. Deming, Seattle representative, National India Rubber Company, Wire Department, 524 First avenue South, Seattle, is making a six-weeks' business trip to Boston and other eastern points.

Captain E. M. Murphy, United States Engineers, has returned to the Seattle office of the Westinghouse Electric & Manufacturing Company. He will take up the work of application of the company's product to mining and smelting operations.

W. A. Marsden, recently with A. H. Cox & Company, 307 First avenue South, Seattle, as electrical engineer and prior to that with the Pacific States Electric Company, 570 First avenue South, and Stanley D. Howell have taken over the Home Appliance Company. The name has been changed to the Electric Appliance Company. The present location is at 118 Spring street, where specialties are being made of Thor washers, ironers and vacuum cleaners. Eventually the concern will move to a new location near Fifth and Pine streets where a first-class electrical retail store will be conducted.

SEATTLE TRACTION CLOSES DEAL

The Seattle city council finally passed the ordinances providing for the purchase of the street car system of the Puget Sound Traction Light & Power Company, on Tuesday, December 31, 1918. The different phases of the traction deal are covered by four ordinances. The bond ordinance directs the acquisition of the street railway property of the Puget Sound Traction Light & Power Company and authorizes the issuance of \$15,000,000 in utility bonds bearing 5 per cent interest to pay for the property. These bonds are to be paid in 18 annual installments beginning March 1, 1922. The purchase ordinance carries the contract of purchase with terms and conditions and also the contract for the purchase of power by either party to the contract from the other. The other two ordinances cover running rights over the city lines of Tacoma and Everett interurban cars. Corporation counsel is preparing the city's answer in the suit brought by F. W. Twitchell to prevent the council consummating the deal. As both the traction company and the city are interested in obtaining a court decision in the shortest time possible, both sides are endeavoring to facilitate the action in the Superior court where the case was filed, so that it can be sent to the Supreme Court with no unnecessary delay. Now that the deal is practically closed, so far as the city council is concerned, it develops that the city is to become the traction company's largest power customer and at the same time the company's only competitor in the electric power field in Seattle. Included in the street railway deal is a contract which binds the traction company to sell the city sufficient power to operate the street railway system for eight years at 1 cent a kilowatt. It is estimated that the city will use under this contract about 20,000 kilowatts. While the city now has contracts for all the power the municipal plants produce, the capacity of the Cedar river plant is being increased. Mayor Hanson and J. D. Ross, superintendent of the light department, have recommended the addition of another unit to the steam plant and it is proposed to go ahead with the construction of the power plant on the Skagit river as soon as the tests being made by the city engineer indicate the proper rock foundation for a dam.

NEW EDUCATIONAL COURSES OF INTEREST TO ELECTRICAL MEN

More and more opportunities for technical instruction are being offered each year by the Extension Division of the University of California. The work is particularly adapted to the needs of those obliged to work during the day and able to spend time for self-improvement in the evenings. The University's elementary extension courses along engineering lines are well attended in many of the towns and cities of California and its correspondence courses go to practically every community in the State.

Evening classes of interest to engineers are being started this month in San Francisco. One of the most important is a course on electrical machinery which will be given in the laboratory of the Polytechnic High School on two evenings a week. It is an elementary course, arranged for stationary engineers and all men who have to do with handling and selling electrical machines.

The class will start at 8:20 p.m. Tuesday, January 14th and will meet at the same hour on Tuesdays and Fridays for 15 lessons. At the conclusion of the course the class will be immediately reorganized for advanced work along the same lines.

The study will include the elements of electric circuits, simple circuit generators and motors, transformers, control apparatus, protective apparatus and alternating current machines.

Other courses of importance to engineers are Applied Mechanics and Reinforced Concrete engineering. These

courses run from 7 to 8 o'clock on Monday evenings in Room 312, Lick Building, commencing January 20th.

The work in applied mechanics considers subjects from the standpoint of structural designing and is particularly arranged to supplement the work in reenforced concrete. In the latter course the topics taken up include: Bending moment, shear, fiber stresses, columns, comparison of wood and steel with reenforced concrete beams, properties of concrete, general theory of reenforced beams, etc. Each course consists of 15 one-hour lessons.

Other engineering and technical courses starting this month in San Francisco include: Oxy-acetylene welding, automobiles, marine engineering, farm tractors, automobile electricity and chemistry.

Those interested are invited to visit the University Extension's office, 599 Market street, corner of Second.

CENSUS OF CENTRAL ELECTRIC LIGHT AND POWER STATIONS

Preliminary figures from the forthcoming quinquennial report on the central electric light and power stations of the states of Wyoming and Arizona have been given out by Director Sam. L. Rogers, of the Bureau of Census, Department of Commerce. They were prepared under the supervision of Eugene F. Hartley, Chief Statistician for Manufactures.

The statistics relate to the years ending December 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which consume the current generated; those operated by the federal government and state institutions; nor plants that were idle or in course of construction.

The number of establishments in Wyoming shows a most decided gain since 1907. This increase is almost wholly confined to the five-year period of 1912 to 1917, for which 23 new establishments were reported, 13 commercial and 10 municipal. All of the 20 establishments shown for 1912 were reported also for 1917. From 1912 to 1917 the total income increased \$429,826, or 70.8 per cent, and the output of stations 15,852,456 kilowatt hours, or 136.9 per cent. From 1907 to 1917 the corresponding increases were \$285,515, or 91.2 per cent, and 6,081,483 kilowatt hours, or 110.6 per cent. Not only the number of employes but their average annual compensation has increased from census to census.

The commercial use of electricity in Arizona shows a remarkable increase at each census for which statistics are

CENTRAL STATIONS IN WYOMING

	1917	1912	1907	Per cent of increase ¹	
				1907-1917	1912-1917
Number of establishments	43	20	18	138.9	115.0
Commercial	31	18	18	72.2	72.2
Municipal	12	2	—	—	500.0
Income	\$1,036,921	\$607,095	\$317,580	226.5	70.8
Electric service	951,101	595,465	303,683	213.2	59.7
All other	85,820	11,630	13,897	517.5	637.9
Total expenses, including salaries and wages	\$894,375	\$445,789	\$235,846	279.2	100.6
No. of persons employed	261	163	96	171.9	60.1
Salaries and wages	\$259,786	\$149,356	\$ 77,811	233.9	83.9
Total horsepower	27,462	11,596	5,125	435.8	136.9
Steam engines:					
Number	56	45	34	70.6	28.9
Horsepower	22,837	10,162	4,360	423.8	124.7
Internal-combust'n engines:					
Number	23	1	—	—	2200.0
Horsepower	1,937	100	—	—	1837.0
Water wheels:					
Number	12	11	6	100.0	9.1
Horsepower	2,688	1,334	765	251.4	101.5
Kw. capacity of dynamos	20,627	8,212	3,208	543.0	151.2
Output of stations, kw-hr.	27,433,023	11,580,567	5,499,084	398.9	136.9
Stationary motors served:					
Number	826	672	131	530.5	22.9
Horsepower	14,957	6,224	685	2083.5	140.3
Number of street lamps:					
Arc	339	396	(²)	—	—14.4
Incandescent, etc.	3,728	1,168	(²)	—	219.2

(¹) A minus sign (—) denotes decrease.

(²) Not available.

presented. There was an increase of 13 in the number of establishments from 1912 to 1917, four of which were municipal, this class of stations being shown for Arizona for the first time at the census of 1917. From 1912 to 1917 the total income increased \$986,447, or 82.5 per cent, and the output of stations 32,771,669 kw-hr., or 99.4 per cent. Although the actual increases from 1907 to 1917 were less—\$603,336 and 23,567,782 kw-hr. respectively—the proportional increases—105.9 per cent and 250.9 per cent, respectively—were greater. The figures are shown in detail in the accompanying table.

CENTRAL STATIONS IN ARIZONA

	1917	1912	1907	Per cent of increase ¹	
				1907-1917	1912-1917
Number of establishments	29	16	15	93.3	81.3
Commercial	25	16	15	66.7	56.3
Municipal	4	—	—	—	—
Income	\$2,141,633	\$1,173,186	\$569,850	275.8	82.5
Electric service	1,888,954	1,128,862	544,192	247.1	67.3
All other	252,679	44,324	25,658	884.8	470.1
Total expenses, including salaries and wages	\$1,752,154	\$923,258	\$464,350	277.3	89.8
No. of persons employed	436	217	148	194.6	100.9
Salaries and wages	\$461,163	\$219,798	\$130,663	245.3	105.3
Total horsepower	38,662	22,075	7,746	399.1	75.1
Steam engines:					
Number	28	33	32	—12.5	—16.2
Horsepower	23,870	12,775	6,926	244.6	86.8
Internal-combust'n engines:					
Number	15	—	3	400.0	—
Horsepower	3,592	—	70	5031.4	—
Water wheels:					
Number	4	4	4	—	—
Horsepower	11,200	9,300	750	49.3	20.4
Kw. capacity of dynamos	26,972	14,756	4,939	446.1	82.8
Output of stations, kw-hr.	65,731,753	32,960,084	9,392,302	599.8	99.4
Stationary motors served:					
Number	1,364	741	339	302.4	84.1
Horsepower	16,050	12,547	2,220	643.5	31.5
Number of street lamps:					
Arc	430	454	(²)	—	—5.3
Incandescent, etc.	4,194	1,335	(²)	—	214.2

(¹) A minus sign (—) denotes decrease.

(²) Not available.

INCREASING THE CARRYING CAPACITY OF WIRES

A letter from Theodore N. Vail, president of the American Telephone and Telegraph Company, announces the invention and development by the technical staff of the Bell System of "a practical system of multiplex telephony and telegraphy by the use of which it is now possible to increase many fold the message-carrying capacity of long telephone and telegraph wires."

With this new system four telephone conversations over one pair of wires are simultaneously carried on, in addition to the telephone conversation provided by the ordinary methods. The nature of these developments is such that, if desired, wires may be used partly for telephone and partly for telegraph. A pair of wires is available either for five simultaneous telephone conversations or for forty simultaneous telegraph messages, or partly for one and partly for the other.

NEW ENGINEERING COLLEGE IN JAPAN

The Tohoku Imperial University is adding a new engineering college. This will include the departments of electrical engineering, mechanical engineering, and applied chemistry. A sum of about 500,000 yen (\$250,000) will be needed for equipment. The instruction will begin this winter.

THE WESTERN ELECTRIC COMPANY'S PLAN FOR FORMER EMPLOYEES NOW IN MILITARY SERVICE

The Western Electric Company announces as its policy that former employes who have been given a leave of absence for military service and who have been honorably discharged therefrom and who desire to again take up work in the company, should make application within thirty days after being mustered out of service. If possible they will be promptly assigned to work for which their previous experience qualified them, at the rate of pay which others are then being paid for similar work. If it is not possible to assign them to work

immediately, they will be placed on a preferred list until such time as business conditions enable the company to place them. During their continuance on this preferred list they will enjoy the same rights with respect to the Employees' Benefit Plan as they had while in the service of the United States, and they may take other employment. When they are notified of a vacancy they should present themselves for work at the time stated and failing to present themselves for ten days thereafter their leave of absence shall terminate. Before assignment to any work, their suitable physical condition for such work must be determined in accordance with the regular routine.

A UNIVERSITY EMPLOYMENT BUREAU

A Bureau of Occupations has been established by the California Alumni Association, with its main office located at Berkeley, California. Its purpose is to aid employers to choose from the graduates of the University of California workers who will meet their requirements. The bureau is now registering men and women and is prepared to furnish workers, many of them highly skilled in professions, as well as recent graduates. No fees are charged.

REPORT OF CALIFORNIA WATER COMMISSION

The California State Water Commission, in its second biennial report, just issued, is making the unique recommendation that the salaries of two of its three \$5000 a year commissioners be abolished. The commission is composed of A. E. Chandler of Berkeley, president, W. A. Johnstone of San Dimas and Irving Martin of Stockton. The water commission act became effective December 14, 1914. It provided for three commissioners at a salary of \$5000 per year, and Governor Johnson appointed the three men named. After four years of experience the commission is now recommending its own reconstruction. The seventeen western states which are thought of as "irrigation states" are: Arizona, California, Colorado, Dakota, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. Arizona and Montana are the only two in which water codes have not been adopted calling for the initiation of rights, the adjudication or determination of rights and the distribution of water among those entitled to its use. In the remaining fifteen states, applications to appropriate water must be made to a central office, which office in various states is termed state engineer, water commission or water board. The most important work of these central offices is the initiation of rights, or the control of new appropriations. In this connection the commission recommends:

"In practically all of the irrigation states a single officer has authority to pass upon applications to appropriate water, with provision for the right of appeal to the water board. As the work of passing upon applications to appropriate will require the greatest expenditure of time by the commission, in the interests of economy and administrative efficiency, it is recommended that the formation of the commission be changed to include one executive member on a stated salary, and two associate members on a per diem basis. The executive member shall have exclusive power to act upon all applications to appropriate, subject to appeal to the full commission. The associate members shall perform all the duties now imposed upon members of the commission, except that they shall have jurisdiction over applications to appropriate in cases of appeal only."

It is understood that the commission proposes to follow up its recommendation by submitting to the legislature the necessary enabling proposals to make its recommendation effective.

In the matter of the use of water, and as indicating that a permit cannot be held for speculative purposes, the commission quotes from the act as follows:

"When the party entitled to the use of water fails to beneficially use all or any part of the water claimed by him, for which a right of use has vested, for the purpose for which it was appropriated or adjudicated, for a period of three years, such unused water shall revert to the public and shall be regarded as unappropriated public water." It is therefore evident that a person obtaining a water right must continue to apply the water to beneficial use, otherwise his right is forfeited.

In the administration of water law, there are three im-

portant steps: The initiation of new rights, the adjudication of existing rights and the distribution of water to those legally entitled to its use. The commission is now in the second phase of the work, and is engaged in making an adjudication and determination of the rights on the Stanislaus River. This will be the first adjudication, and will serve as a basis for work in the future. The Stanislaus is an important stream both from the standpoint of power development and irrigation, and the commission entered upon the adjudication of this river on the joint petition of the South San Joaquin and Oakdale Irrigation Districts. The field work in connection with the examination of a stream system includes the survey of irrigated land and the measurement of streams and ditches. The survey and maps of the Stanislaus have been completed and claimants of water rights are now submitting proofs of appropriation. At the 1917 session of the legislature that part of the water commission act dealing with the determination of water rights was amended so that it now follows closely the procedure of Oregon and Nevada, the water legislation of which states has been upheld by the state and federal courts. The ascertainment proceedings under the statute are restricted to the determination of rights by appropriation, and only those riparian owners who desire to appear as appropriators need file claims. No riparian right is affected by the determination. It is the theory of the commission, and carried out in practical operation, that those having water rights be saved all possible trouble and expense for legal advice, surveys, measurements, etc., except where the parties interested are unable to agree with the accuracy of the surveys or measurements made by the commission.

The water commission cooperates with the U. S. Geological Survey in stream measurement work, and makes a considerable appropriation from its own funds for this purpose. The records thus obtained are very valuable as indicating the waters in the streams available for appropriation. The commission is also cooperating in irrigation investigations with the U. S. Department of Agriculture. Very valuable results have been achieved in this direction, as showing the duty of water in rice irrigation in the Sacramento Valley. The results of the experiments are printed in bulletins and are available to those interested.

The commission is renewing the recommendation made in its last biennial report for further legislation regarding the control of the distribution of water to those entitled to its use. This is the third step in water legislation. With the exception of Arizona, California and Nevada, this necessary machinery is provided in the water codes of all the irrigation states. The present act provides that the commission shall have power to supervise the distribution of water, but fails to provide the necessary machinery. To cure this defect is the purpose of the recommendation of the commission. The beneficial results of supervision are afforded in a citation by the commission of the West Fork of the Carson River, an interstate river rising in California and flowing into Nevada. The distribution of the water is under supervision in Nevada, but is not supervised in California, and the results on the two streams furnishes a very instructive object lesson.

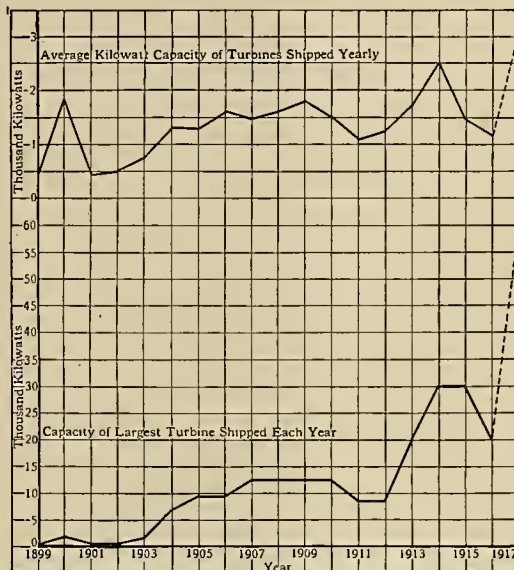
The commission states that it is apparent from the number of inquiries received, that there is vital need for legislation which would permit a party, even though not engaged in public service, the right of eminent domain for rights of way for ditches, it being necessary for any one who desires to appropriate water to show right of access to his proposed point of diversion. Hence the commission is recommending that the right of eminent domain to parties not engaged in public service be given in such terms that its meaning cannot be successfully questioned. Very frequently it happens that a person having the facility to use water, or having an available diversion site, does not avail himself of the opportunity, and plays the dog in the manger by refusing any one else access at a reasonable compensation.

LATEST IN EVERYTHING ELECTRICAL

(The progress of the steam turbine from its origin through the last thirty years is here reviewed with charts showing the increase in capacity. The description of a motor starter and controller especially designed for use under the severe operating conditions found in mines and a report of the largest kva. capacity polyphase regulator built follow.—The Editor.)

STEAM TURBINE PROGRESS REVIEWED HISTORICALLY

Roughly speaking, the whole of the development of the steam turbine has occurred within thirty years. This is a very brief period as compared with the development of the reciprocating engine, which occurred over a period of more than ninety years. Many are inclined to attribute this to



A chart showing the capacity of the turbines shipped yearly by the Westinghouse Electric & Manufacturing Company from 1899 to 1917.—Fig. 1.

the high technical skill and scientific attainment of the present age, but a more true reason than this is the fact that metallurgical and manufacturing arts were available for the turbine manufacturer which were not available for the early builders of steam engines.

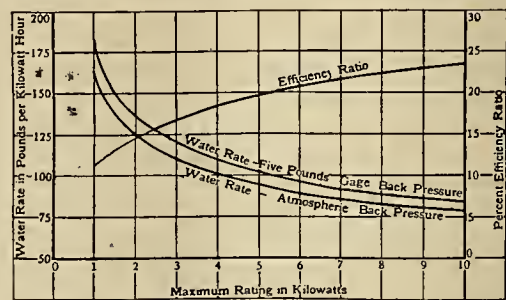
Fig. 1 shows the increase in the capacity of single units as built from year to year. The average capacity of turbines is also shown; it has not, however, been continuously an upgoing scale on account of the growth of business in single wheel impulse turbines of small capacity. In 1909 was commenced the development of small, single disc, non-condensing turbines of the reentry type, intended primarily for the operation of condenser auxiliaries. Their general performance was so encouraging that in the course of time a line of excellent small machines suitable for electric generator drives, and also adaptable for driving any other kind of machinery, have been developed. The smaller ones, up to 15 kilowatts, are direct connected; above that they were geared. The general performance is shown by Fig. 2. The past two decades have seen a growth in the size and economy of steam turbines beyond the most optimistic expectation of twenty years ago, as is shown graphically by the charts.

Progress and Future Possibilities

Discussion of the general progress of turbine development in the past is not complete without reference to the possibilities of the future. It is plain that with turbines of large size, which deliver to the switchboard 76 to 80 per cent of the theoretical energy available from the steam expanding between the limits specified, further improvements in the

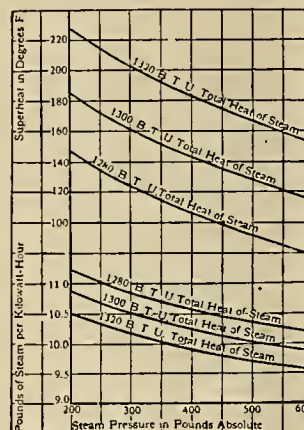
turbine itself will not materially raise this efficiency, and that further improvement in central station economies must be looked to from causes other than the steam turbine. This is a subject of the greatest importance in view of the rapidly increasing cost of fuel and justifies considerably more capital expenditure for economizers and other plant apparatus which will reduce fuel cost.

Attention at the present time is being directed to employing higher boiler pressures, viz., pressures as high as 600 pounds. Today 200 pounds pressure, 200 degrees F., superheat is regarded as a more or less every day operating condition for large plants. Steam generated at 600 pounds pressure, having exactly the same heat content as that contained in 200 pounds pressure and 200 degrees F. superheat, will have a superheat of approximately 128 degrees F. This



A diagram illustrating the general performance of the smaller types of turbines

expanded to 29 inches of vacuum is theoretically capable of giving 13 per cent more energy than when generated at 200 pounds. Doubtless, when operating under these conditions, the turbine will be of lower efficiency. The high pressure element will be less efficient on account of the great density and the small volume of steam, and on the other hand the low-pressure elements will be less efficient because of the great amount of water precipitated by the steam expansion



Steam generated under the high pressure of 600 pounds will have a superheat of approximately 128 degrees F. This expanded to 29 inches of vacuum is capable of giving 13 per cent more energy than when generated at the usual pressure of 200 pounds. Allowing for a loss in efficiency, the turbine will avail itself of at least 50 per cent of this possibility, producing a net saving of from 6 to 7 per cent.

from the high pressure, introducing a brake in the turbine. However, it is reasonable to suppose that the turbine will avail itself of at least 50 per cent of this 13 per cent possibility, producing a net saving of 6 or 7 per cent. What may be expected to be derived from higher pressures is exhibited in Fig. 3, plotted for various pressures.

To make similar comparison between a modern large turbine installation and the best performance of reciprocating engines, assume:

	Turbines	Engine
Initial cost per kw. of the generating units.....	\$ 8.00	\$40.00
Fixed charges, per cent.....	.15	.15
Pounds steam per kw-hr.....	.11	.17
Cost of steam per thousand pounds at 220 pounds 150 degrees superheat, 175 pound dry sat.....	.15	.14
Load factor .....	.75	.75
Cost of foundations per kw.....	.50	2.50
Cost of condensers per kw.....	3.50	2.50
Cost of engine room personnel, not including execu- tive administration, per kw. per year.....	.61	1.57
Oil and engine room supplies per kw. year.....	.10	1.34
Total cost per kw. year.....	\$13.34	\$25.29

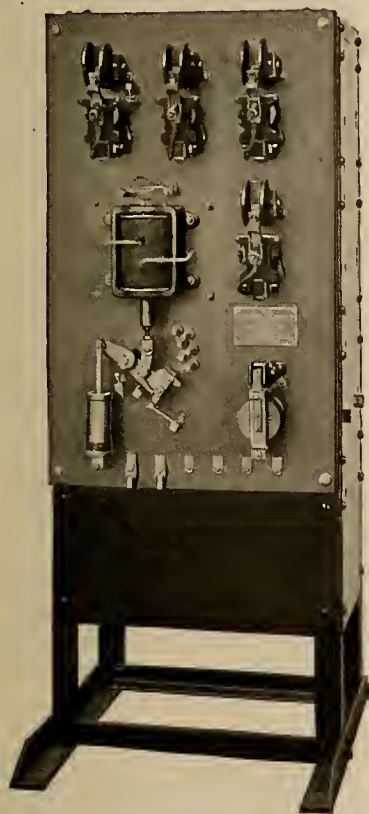
The modern large turbines have therefore accomplished a saving over the best reciprocating engine installation of approximately 47 per cent. The cost of energy has been no doubt reduced to one-half, if consideration is given to reduced size of buildings, etc.

MINE DUTY STARTERS

On account of the injurious effects of moisture present in mines and the severe operating conditions, special care should be used in the selection of motor starters and controllers, particularly the

starters and controllers for the ventilating fan and pump motors, as in most mines these two pieces of apparatus must be kept in continuous operation to free the mine of water and exhaust the dangerous gases. Another condition which affects the operation of motor starters is the wide fluctuations in generator or line voltage caused by mine hoists and locomotives. For these reasons the standard design of hand or automatic starter will not operate satisfactorily and a starter should be selected which is especially adapted to operate under such conditions.

The accompanying illustration shows a Mine Duty Self Starter manufactured by the Cutler-Hammer Manufacturing Company of



A mine duty self-starter designed for mine use with ventilating fans or pump motors.

Milwaukee, which has recently been redesigned and which embodies several operating and protective features essential to the continuous operation of a ventilating fan or pump motor.

Plain hand starters and starters without self-resetting features will drop to the "off" position every time a large drop in voltage occurs; this of course stops the motors controlled by them and serious results may follow. When a motor receives current at a voltage considerably lower than its rated potential it will slow down, and stop when this voltage drops to a certain value or when the current is "off." Control apparatus is required that will automatically insure the continuous running of the pumps and fans, even if at reduced speeds, and will also restart them after a complete interruption and subsequent resumption of current supply.

To meet these conditions the starter illustrated, which is a pilot switch accelerator type for motors up to 100 h.p., is equipped with a rugged relay which is very sensitive and positive in its action. This relay guards against injury to the motor; it causes all of the armature resistance to be inserted in case of a bad drop in voltage, thus checking the heavy current resulting from the decreasing counter electromotive force. If the line pressure falls to about 80% of normal the relay drops out, opening the control circuits to the accelerating switches which drop in turn and cut into circuit the heavy duty starting resistance, which has capacity for continuous service at low voltage. The motor then runs at slow speed until the voltage increases and at about 90% normal the relay pulls in again, cutting out the the resistance and permitting the motor to accelerate to normal full speed.

A single coil overload, where shunt wound motors are used, can be added to also insert the armature resistance in case of an overload and thus keep the fan or pump going at a reduced speed. This single-coil overload and the voltage relay prevent the shunt motor from flashing over under severe voltage fluctuations. When the voltage drops to a very low value the motor tends to run as a generator and is liable to "flash over" across the brushes, injuring the motor and commutator. With a compound motor the overload is not so necessary because when the motor tends to run as a generator, the compound winding opposes the shunt winding, neutralizing the field and preventing those conditions which result in "flashing over."

POLYPHASE INDUCTION REGULATORS

The largest kva. capacity polyphase regulator ever built was completed for the Hartford Electric Light and Power Company of Hartford, Conn. The rating is 1000 kva, three-phase, 60 cycles and provides 10 per cent regulation on a 10,000 kva, 11,000 volt, three-phase, 526 ampere circuit. The regulator is an oil immersed, forced-oil-cooled type, which is a new but very successful departure in the method of cooling regulators.

In this method of cooling, the cold oil is forced in at the bottom of the regulators through the lower portion of the windings, which extend below the core, and which are especially spaced so as to give a free passage for the oil. As the oil passes upward it is forced through three separate and distinct passages, each passage being of such size as to allow a flow of oil in proportion to the heat generated.

One oil passage is inside the rotor iron along the rotor shaft, one outside the stator iron between the regulator and the tank, and the third through the gap between the shunt and series windings. After passing through the upper portion of the windings, which are spaced in the same manner as the lower portion, the oil overflows into a channel along the inside of the tank. In order that the flow into the channel be uniform from all directions a special distributor is provided. From the channel the oil is conducted by gravity through a series of cooling coils to a storage tank and from the storage tank is again forced through the regulator.

The regulator is of the skeleton frame design with a sturdy mechanical construction.

The conductors of the windings are heavily insulated and the insulation on the outside of the coils is in proportion. The strand insulation of the shunt winding is exceptionally strong and additional insulation is used between layers. The series of coils are of one turn per layer and the turns are insulated from each other with insulation which will withstand a potential greater than the full line voltage.

In order to allow free passage of the oil through the coil insulation into the coil, each coil is provided with a vent at the bottom. In addition the complete machine is given a vacuum oil treatment to remove any air pockets that may exist in the coils.

BOOKS AND BULLETINS

Ocean Cable Systems

Preliminary figures of the forthcoming quinquennial report on the ocean cable systems of the United States have been given out by Director Sam. L. Rogers, of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of Eugene F. Hartley, chief statistician for manufacturers. The companies making up the Ocean Telegraph totals for 1917 are, as in 1912:

Central and South American Telegraph Company
Commercial Cable Company of Cuba
Commercial Cable Company of New York
Commercial Pacific Cable Company
Mexican Telegraph Company
United States and Hayti Telegraph and Cable Company

The statistics relate to the years ending December 31, 1917, 1912 and 1907, and are subject to such revision as may be necessary after further examination of the original reports.

The figures show that for the five years 1907 to 1912, as well as for ten years, 1907 to 1917, there were substantial gains. During the five years the gains in the extent of ocean cable telegraphic traffic was \$7,597,272, or 94.2 per cent; and in net income \$3,554,022, or 120.4 per cent. The ten year gain in these respects was \$8,324,790, or 113.4 per cent, and \$2,477,795, or 61.5 per cent, respectively.

The amount of capital stock outstanding in 1917 was \$60,900,000, or 9.8 per cent greater than in 1912. The gain in this respect during the ten years was \$8,100,000, or 15.3 per cent. The number of employes, salaried and others, increased 310, or 18.7 per cent during the five years, and their total salaries and wages \$597,337, or 51.2 per cent. For the ten years the increase in number was 759, or 62.9 per cent, and in salaries and wages \$849,268, or 92.8 per cent.

Government Publications

The details of Germany's activities in the Bolshevik revolution are published in bulletin No. 20 of the War Information Series issued by the Committee on Public Information.

"The Present Development of Transmission Lines in Kansas" is taken up in Engineering Bulletin No. 10 of the University of Kansas, with an appendix on "The Calculation of Iron Wire Lines" by F. Ellis Johnson.

"The Relative Corrosion of Cast-iron, Wrought-iron and Steel Pipe in House Drainage Systems," a paper by Wm. Paul Gerhard, is published by the American Society of Mechanical Engineers as an advance paper for the convention in New York City recently past.

G-E Bulletin

Rheostat and Compensator Mechanisms form the subject matter of bulletin No. 47702 of the Schenectady Works of the General Electric Company. The bulletin is profusely illustrated and will prove of value to those purchasing such machinery.

Miscellaneous

Display boards for supply parts are advertised in a recent bulletin by the Universal Fixture Corporation.

"California Mineral Production for 1917" with county maps forms the subject of Bulletin No. 83 of the California State Mining Bureau.

Tungsten, Molybdenum and Vanadium in California are discussed in a recent publication of the California State Mining Bureau. A supplementary bulletin takes up the Antimony, Graphite, Nickel, Potash, Strontium and Tin in their occurrence in the state.

Annual Report

The Seventh Annual Report of the Toronto Electric Commissioners on the Toronto Hydroelectric system has re-

cently been issued, with complete statistical information for the year ending December 31st, 1917.

Graphic Instruments

A recent bulletin issued by the Esterline Company features a new type of graphic instrument for checking the operation of electrical and mechanical apparatus, a portable graphic power factor meter and a new duplex portable indicating instrument. These instruments are of particular interest in view of the day's interest in the improvement of efficiency in plants and individual machines.

Mine Duty Self-Starters

Mine Duty Self-Starters is the title of a new two-page descriptive leaflet known as publication 408, which is being distributed by The Cutler-Hammer Manufacturing Company of Milwaukee. These Mine Duty Self-Starters are divided into two chief types, both of which are illustrated. In one, the motor is brought up to speed by the action of a solenoid, which draws a pivoted arm over sliding contacts, thus cutting out resistance in the armature circuit and increasing the speed of the motor. The other type uses magnetic clapper type switches in place of the sliding contacts, the switches being closed in the proper sequence by a pilot switch which in turn is operated by a solenoid. The magnetic switch type is intended for motors above 15 h.p. Both types are equipped with magnetic main switches and voltage relays. A C-H Unit Charging Rack for miners' electric lamps is also illustrated. Each rack accommodates 1 to 10 batteries and as many of these units may be installed together as may be necessary.

McGraw Electric Railway List, August, 1918

by the Electric Railway Journal, published semi-annually. Size 4½ by 8½ in.; 272 pages; published by the McGraw-Hill Book Company, New York, and for sale by the Technical Book Shop, San Francisco. Price \$4.00.

The list is one compiled by the Trade Investigation and Directory Department of the Electric Railway Journal and is a complete and valuable reference work. It includes Canada, Mexico, Hawaii, Cuba and the Philippines and gives all operating and holding companies with officials and department and operating heads, the cities and towns connected by inter-urban lines, the population of cities served, number of cars and miles of track, and data on the power plant and substation equipment. In addition, an appendix gives data on Electric Railway Associations and on National and State Railroad and Public Utility Commissions. An unfortunate transposition of pages 211 and 214 is somewhat confusing, but the book as a whole is accurate and carefully edited.

Gas and Flame in Modern Warfare

by Major S. J. M. Auld of the Royal Berkshire Regiment, and a member of the British Military Mission to the United States; size 5 x 8 in.; 202 pages; published by the George H. Doran Company, New York, and for sale by the Technical Book Shop, San Francisco. Price \$1.35.

A fascinating account of the development of defensive and offensive methods in gas and flame warfare, as recounted by the man who has been in touch with gas warfare from the beginning. Major Auld is a chemist who volunteered for service at the outset of the war. Some months after the first gas attack he was taken into the Gas Service, and later became Chief Gas Officer to Sir Julian Byng's army. More recently he has been in the United States at the request of our government, teaching the American army methods of the new science.

The book takes up the experiences of the first few weeks and the experimentation to determine the best method of defense, and then the later developments with each new type of gas used. The subject matter is of the greatest interest and the author's style highly entertaining.

NEW ELECTRICAL DEVELOPMENTS

(The adjustment of car fare rates in the Northwest is still a matter of agitation. Plans for construction in Spokane are revised in view of the contract with the Puget Sound Traction Light & Power Company. In the Pacific Central district various pumping installations for irrigation projects are under way and considerable activity is reported from the Southwest and Intermountain District.—The Editor.)

THE PACIFIC NORTHWEST

SPOKANE, WASH.—The Northwest Aircraft Company has been incorporated here for \$50,000 by C. B. Merriam, Harry Goetz, et al.

JUNEAU, ALASKA.—The Chicago Mining Company is considering plans for the erection of a new power plant at its properties for operation.

HUNTERS, WASH.—The electric light plant and the residence of A. Waterbury were destroyed in a recent fire. Property loss is about \$3500.

SPOKANE, WASH.—The Universal Electric Company has recently been incorporated for \$10,000 by C. F. Uhden, G. W. Crowder and A. E. Russell.

KLAMATH FALLS, ORE.—It is expected that a large dam will be constructed next year by the California-Oregon Power Company, at the head of Link River.

TACOMA, WASH.—On January 1st the city of Tacoma took over from the Tacoma Railway & Power Company the operation of the tide flats car line which the company had been operating for the city.

SEATTLE, WASH.—Bids will be received by the Port of Seattle Commission up to February 9th at 2 p.m. for a Gantry electrically operated crane for Pier "B" at Smith's Cove terminal, to cost about \$90,000.

OAKVILLE, WASH.—Rodney Maxwell, a civil engineer of Elma, has been looking over the site for the new light and power plant which the town is planning on installing soon. Maxwell stated that a longer dam built on the Round-tree Creek below the one supplying city water would cost \$1,500.

FOSSIL, ORE.—The Fossil Milling Company was organized recently, among other movements for the development of this place. The objects of the new concern are the furnishing of light and power and the manufacture of flour. They have purchased the Fossil Flour Mill property including all the machinery and electric light equipment, and have sent to Portland for additional machinery.

SPOKANE, WASH.—Believing that the city has no immediate need of additional substations for the lighting department now that it is able through the traction deal to buy current from the Puget Sound Traction Light & Power Company, Mayor Hanson states that he will veto two ordinances recently passed by the council, one appropriating \$15,000 to buy a site in the tide lands for a new substation and the other appropriating \$10,000 to complete the ballard station.

TACOMA, WASH.—The 7-cent fare has not been of sufficient avail to prevent a deficit in the returns of the Tacoma Railway & Power Company, according to the latest report of the manager, L. H. Bean. The deficit of the company for the five months of 7-cent fares has been \$164,739 while for six months under 5-cent fares the deficit was only \$95,726.52. This showing was made by an increase of 51.30% in wages to the car men and in increasing the service 72%.

SEATTLE, WASH.—Immediate construction of a permanent station for the Everett interurban cars at a cost of \$100,000, at the southeast corner of 6th avenue and Olive street, this city, has been announced by A. W. Leonard, vice-president of the Pacific Northwest Traction Company. The structure will be erected by the Puget Sound Traction Light

& Power Company. Work is to start at once and it is presumed the station will be ready for use by the coming summer.

PORTLAND, ORE.—The Pacific Power & Light Company, which operates public utilities in about 50 cities and towns in Oregon, Washington and Idaho, has disposed of an issue of \$1,265,000 in five per cent first mortgage gold bonds, due August 1, 1930. The company's bonds are secured by first mortgage upon the entire physical property of the company. Net earnings for the twelve months ending November 30, 1918, were nearly twice the interest charges on all bonds outstanding.

VANCOUVER, B. C.—So far as the 1918 council of Vancouver, B. C., was concerned it announced, upon the filing of a written report from McCrossen and Harper, special counsel, that no further action would be taken regarding the six-cent fare of the British Columbia Electric Railway. The report was received by the counsel in committee and dealt with the unsuccessful injunction suit recently filed by the city. Any action on the six-cent by-law before its expiration in April will have to be taken up by the 1919 council.

TACOMA, WASH.—A report on the estimated cost of creating a storage basin on E creek near Elbe and of the flow of the water in the creek, was sent to the city council recently by Norton L. Taylor, engineer for the light department. The storage basin is wanted to allow the Nisqually power plant to run at its maximum all the year round. The basin would furnish 49,133,000 kilowatt hours of added current a year, Engineer Taylor states, at a cost of .085 cents a kilowatt hour against the present cost of .29 cents for current from the city's plant. The estimated cost of the basin, including all items, is \$557,960.

SEATTLE, WASH.—The Alaska Petroleum & Coal Company, with offices in the New York building, completed last October 22 miles of railroad from the landing in the vicinity of Katalla on Controller Bay, to its anthracite coal mines which have been opened by constructing haulage tunnels to the veins. It is contemplated that the coming season will find the company in position to mine 500 tons of coal a day. In the spring rolling stock and locomotives will be shipped from Seattle for the railroad. The mines are located in the Bering river region. Hydroelectric development on this is a possibility but the power sites are on the public domain and that phase of the matter would have to be adjusted.

VICTORIA, B. C.—Engineers are now on the ground running lines and securing data for the drafting of the plans of the hydroelectric plant which the provisional government will install at Squamish to provide power and light for the Pacific Great Eastern terminal plant there, as well as for the town of Squamish. The enterprise, which will call for an outlay of between \$40,000 and \$50,000, will be of great importance to the town besides improving the facilities at the car repair shop and roundhouse of the government-owned railway line. The late owners of the road contemplated a similar plant but on a much larger scale and a considerable portion of the equipment bought by them is still available. The company had intended to secure its water power from Monmouth creek but the government plans to derive its water from the Stawamish River.

SEATTLE, WASH.—According to City Engineer A. H. Dimock subways, aerial roadways and elevated car lines will soon be needed in Seattle to take care of the city's growth. The city engineer states in his annual report that new thoroughfares planned by the city should be so constructed as to provide separate accommodations for fast automobile and slower truck traffic. He would have aerial car tracks swung over the city to provide rapid access to the heart of the city. A subway under Third avenue to carry passengers from the north to the railroad depots and proposed electric stations in the south is advocated.

PORTLAND, ORE.—An increase in rates that should help materially in overcoming prevailing high operating costs has been granted the Northwestern Electric Company by the Public Service Commission of the State of Oregon. The increase, which applies to all of the company's business in the city of Portland, became effective on the first of the present month. Statisticians of the company have figured that the increase in rates will be equivalent to an increase of about \$80,000 in the company's annual net earnings.

THE PACIFIC CENTRAL DISTRICT

OAKDALE, CAL.—H. A. Niedig has opened an electrical shop in the building formerly occupied by Johnson's Cyclery.

PALO ALTO, CAL.—The Board of Public Works has instructed the city engineer to proceed with the work of installing street lamps in South Palo Alto.

FRESNO, CAL.—Surveys are being made in the mountains for the San Joaquin Light & Power Corporation with a view of preparing for after-war activity.

FRESNO, CAL.—The Lewis Electric Company has been granted the contract for constructing an electrolier system in South Van Ness Avenue on its bid of \$14,250. The city's estimate was \$14,757.

ARBUCKLE, CAL.—An irrigation plant intended to irrigate 200 acres of orchard and which will pump 1000 gallons per minute, is planned here by the new owners of the Hobbs orchard, Tyler and Ross of Los Angeles. Work will be begun at once.

OAKDALE, CAL.—The local power plant, known as the Knight's Ferry power plant, is making improvements and betterments with intention of again placing the plant in operation, having been closed for some time past, to furnish power for shipbuilding and other industrial works in this section.

HOLLISTER, CAL.—The Coast Valley Gas & Electric Company has filed a certificate for right of way on property of 16 residents in the southern end of the county. The company is going to extend a power line from King City to the New Idria mines and it is said that work will commence in the near future.

WOODSIDE, CAL.—A meeting of all formers in Yolo county who use water from the Yolo Water and Power Company for irrigation purposes was called by Secretary Shaffer, of the board of trade. The matter of water for irrigation purposes for the summer season of 1919 was discussed with representatives of the water company.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company and the Coast Counties Gas & Electric Company, of Santa Cruz, are planning for the reconstruction of a number of sections of their overhead lines in compliance with a recent order from the State Railroad Commission. Application has been made to the Commission for an extension in time in which to complete the work.

PLACERVILLE, CAL.—George F. Loughland, acting manager for the Western States Electric Company, stated that petitions for electric lights and power for Diamond Springs will be favorably considered, and if the project carries satisfactorily a transformer will be installed at Diamond Springs to serve the California Door Company. The company

contemplates extensive increase in their service offerings to El Dorado county during the coming year. Twin Lakes and other power stations are under construction for this purpose.

STOCKTON, CAL.—Directors of the Modesto and Turlock irrigation districts have under advisement the construction of a new storage reservoir in connection with an electric power plant, to be known as the Don Pedro storage reservoir. The plans provide for a water capacity of 260,000 acre-ft., with a hydroelectric power plant, the initial installation to have a capacity of from 6000 h.p. to 10,000 h.p.

ALAMEDA, CAL.—Application has been made by the Alameda Sugar Company and the Alameda Farms Company to the State Water Commission for permission to appropriate water from the Sacramento river in Sutter county for the irrigation of 7600 acres of land. It is proposed to install pumping plants at three different places and to connect the three plants. The cost of the work is estimated at \$287,000.

NEVADA CITY, CAL.—Next season the Brandy City Mining Company intends to construct a large restraining dam so they can hydraulic their immense gravel holdings at Brandy City. The barrier will stretch a quarter of a mile across the North Yuba river, below Bullard's bar, and will be 150 feet in height. Near the dam a big power plant will be erected, which will generate electric power for operating the machinery.

NEVADA CITY, CAL.—The big River Dam on the South Yuba river, about five miles above the Rome power house, and now owned by the Pacific Gas & Electric Company, is being blasted out. The River Dam was built over twenty years ago by the Bay Power Company and was constructed without a fish ladder. Since then the law requires a fish ladder to be built on every dam and as this dam is not being used and it was found that the cost of a fish ladder was far greater than the expense of blasting it out, the company decided to destroy it.

TRACY, CAL.—The greatest part of a recent session of the city trustees was taken up in a discussion of the matter of installing electroliers along Central Avenue and the business section of Sixth Street. The matter was put up to Trustees Lang and Heil, as the committee on street lighting, to make a choice of posts for the same. Samples and estimates were furnished by the Westinghouse Electric Company and the Pacific States Electric Company, and C. S. Northcutt of the Sierra & San Francisco Power Company was present to give information as to the work of installation done by this company and the relative cost of service.

OROVILLE, CAL.—According to reports received here from Concow Valley, the Pacific Gas & Electric Company is preparing to begin the development of a storage proposition there for power and irrigation purposes. It is said surveys have been completed and that the plans of the company contemplate a dam to impound the water covering an area of 2500 acres. This water is to be fed into the ditch that now serves Oroville. The valley was originally used as an impounding reservoir to supply water during the era of large hydraulic operations in Cherokee. The dam gave way a number of years ago, and since then has not been repaired.

REDDING, CAL.—That the project of building great power plants in Pit river above Copper City for electrifying the Southern Pacific is rapidly unfolding is shown by an instrument filed for record on Dec. 20th. The Central Pacific contracts to sell to the Pit River Power Company 6,447 acres of land along Pit river above Copper City and extending to the big bend for \$194,093. A heavy payment was made to bind the bargain. Unpaid balances bear interest, but the entire amount must be paid by January, 1922. Rudolph Spreckels of San Francisco and J. A. Whittlesey, representing the Federal Trust Company of New York, filed the contracts. The Pit River Power Company completed its survey two weeks ago. Dudley Moulton is president and C. W. Durbrow is secretary.

THE PACIFIC SOUTHWEST

CASA GRANDE, ARIZ.—Plans are being made for the establishment of an electric power plant here.

BRAWLEY, CAL.—A pumping plant will be installed for E. G. Henley of Lemoore, for irrigation purposes.

ANAHEIM, CAL.—An electrical store will be opened in this place by Roy W. Hamilton, in the location formerly occupied by Kern's Cyclery.

OCEANSIDE, CAL.—The city council has let a contract to Clement B. Stern for an electric pumping engine for the city water works. The price is \$3162.

FLORENCE, ARIZ.—Plans are under consideration by the city council for improvements to the waterworks and lighting systems, to cost about \$80,000.

SAN DIEGO, CAL.—The new management of the Hartwell Electric Company announces that the firm has been reorganized and is now ready for business at 955 Sixth street.

LOS ANGELES, CAL.—The F. E. Newberry Electric Company, 724 South Olive street, has been awarded a contract for electrical work in the Edison Building, Third street and Broadway.

CORONA, CAL.—The Southern Sierras Power Company, through its representative, reported that the company wished to replace incandescent lights on Sixth street with more up-to-date lamps.

EL MORO, CAL.—The Colony Holding Company is building a new power plant in this section to be known as the Atascadero power plant. Considerable work in the new station will be handled by Renard & Stary, electrical contractors of Los Angeles.

CALEXICO, CAL.—Headed by President Borquez of Mexicali, a telephone line will be built from Mexicali to San Felipe. Bids have been asked on 200 miles of telephone wire and contract will be awarded in a few days.

LOMPOC, CAL.—An ordinance has been passed granting the Santa Barbara Telephone Company the right to maintain poles and wires, etc., for the transmission of electricity for telephone and telegraph purposes in this city.

EL CENTRO, CAL.—The directors of the Imperial irrigation district have ordered the roadbed and rock revetment work from Rockwood gate to Hanlon gate, at Andrade, on the west bank of the Colorado river, done by force account under the direction of the general manager, C. K. Clarke. The estimated cost of the work is \$75,628.57.

EL CENTRO, CAL.—Fire in the transmission house of the Holton Power Company at Imperial caused heavy damage. The fire was started by lines between Imperial and Brawley breaking, causing a short circuit in the plant. Temporary apparatus is being set up and in the meantime permanent machinery is being shipped in. The loss is estimated at about \$10,000.

SELIGMAN, ARIZ.—Steps have been taken to organize the Mojave Northern Power Company for the purpose of building and operating the proposed hydroelectric development on the Colorado River north of Seligman and Williams. The company will be capitalized at \$24,000,000. Surveys have been made for the proposed plant. E. L. Beyard is interested in the project.

LA JOLLA, CAL.—Actual signatures amounting to \$49,225 towards a necessary bond issue subscription of \$55,000 have been obtained, and verbal pledges bringing the total subscription to \$51,500 practically assure an electric line connecting with the Spreckels system, which will give hourly service through to the business center of San Diego. The next step will be to form a company to take over the road and sign up with the Spreckels interests for its operation.

HOLTVILLE, CAL.—J. M. Tredenick has been appointed water superintendent and it is contemplated to reorganize the entire water system. In this connection the Holton Power Company contemplates installing a supplementary

power plant to be used in emergency. The company proposes to pay the district \$1500 per month for the use of water to generate power. This water would be turned back into the canal for use in irrigation lower down. The canal would have to be dredged about two miles to get the fall desired, which would cost about \$3000.

LOS ANGELES, CAL.—Byron Erkenbrecher of the Public Service Commission has plans for the construction of the proposed Power Plant No. 2 so that it will be completely financed without the necessity of a bond issue. He suggests that the city council be called upon to appropriate sufficient funds in next year's city budget to guarantee the completion of the plant, and that the public service department reimburse the city treasurer for this loan by monthly payments from power revenue. The power plant will cost \$1,100,000. Owing to the falling in the price of steel, the commission will no doubt reject unopened all bids that may be received for steel for the Plant No. 2 and cause a readvertisement. The penstock will cost approximately \$100,000.

THE INTER-MOUNTAIN DISTRICT

ROUNDUP, MONT.—The Electric Supply Company has been incorporated here lately.

GLENDIVE, MONT.—The electric light plant owned by Pape Bros. burned recently. Loss, \$6000.

HARDIN, MONT.—Pacific Telephone & Telegraph Company will install a new set of poles for its telegraph system.

SKAGUAY, COLO.—Favorable water power conditions this year at the Skaguay hydroelectric plant of the Arkansas Valley Railway Light & Power Company has enabled the plant to show an output 34½% in excess of the preceding year.

CASPER, WYO.—At the meeting of the citizens E. C. Boyle, Major Ormsby and Ben. Scherok were appointed a committee to wait upon the council and place a proposition for the construction or purchase of a municipal lighting plant.

BOISE, IDA.—A syndicate composed of Herbert Lemp, the Idaho Packing Company, the Davis Meat Company, the Boise Valley Packing Company and Ernest A. Evans is contemplating the construction of a packing plant, to cost about \$1,500,000, in Boise.

HELENA, MONT.—The Capital Issues Committee had approved the application of the Western Smelting & Power Company to issue and market \$300,000 in stock with which to complete development of the company properties in the New World mining district in Montana on the border of the Yellowstone National Park.

KELLOGG, IDA.—Bunker Hill & Sullivan M. & C. Company is remodeling the old Sweeney concentrating mill for re-treating the heavy tonnage of tailings that have accumulated in the last 20 years. The mill has the capacity of 500 tons per day. The new equipment is understood to include motors for electric drive.

BOISE, IDA.—At the electric heating hearing before the Idaho public utilities commission recently A. J. Wiley, consulting engineer for the government on its greatest reclamation construction, testified that it was not possible to furnish a sufficient supply of power from the great government Arrow Rock dam, 24 miles from Boise, to furnish electric energy either for light and power or for industrial purposes or heating for this city. He said the first consideration of the government was to supply water to the settlers, and not electric energy to the cities, and, even if a plant should be installed, it would be made subservient to irrigation and the power service would not be dependable. He said further that it was impossible to heat by electricity in this climate as cheaply as with coal, and the reason the government plant at Minidoka could furnish cheap electrical installation was because the electrical installation was for pumping for irrigation, and it cost no more to run the plant in winter time than to let it remain idle.

THE VACUUM CLEANER

THE VACUUM CLEANER

CLEANING HOUSE always reveals unexpected treasures which are dusted and appear again on mantel piece and table for ornament and use. The Vacuum Cleaner is hailed in our advertising columns as doing away with house cleaning at stated periods—it is a perpetual affair. But although there remains no back closet treasure chest about the editorial office to unearth, there are many odds and ends recovered daily from the dust heap of mere personal conversation. These are here preserved for more general ornament and use through the services of the Office Vacuum Cleaner.—The Editor.



Here is a soldier's prayer which is likely to come true one of these days when the boys come back. It appeared in the R. & M. Cooperator, but its individual origin is unstated.

THE SOLDIER'S PRAYER

Now I lay me down to sleep,
I pray the Lord my gun to keep,
Let no other soldier take
My socks and shoes before I wake.

Lord, please grant me with my slumber
To keep this cot upon its lumber.
May no peg or guy rope break,
And let my tent down before I wake.

Keep me safely in thy sight,
Grant no fire drills at night.
And in the morning let me wake
Breathing scents of sirloin steak.

Take me back into the land,
Where they walk without a band,
Where no thrilling bugle blows,
AND WHERE THE WOMEN WASH THE CLOTHES.

In a cozy feather bed,
Where I long to lay my head,
Far away from camping scenes,
And the smell of half-baked beans.

God, thou knowest all my woes,
Heed me in my dying throes;
Take me back—I PROMISE THEN
NEVER TO ENLIST AGAIN.

AMEN.

A strange phenomenon in this outbreak of the office linotype machine has given pleasure to the members of the Journal staff and is here passed on:

THE NEW YEAR'S EVE BREAK-OUT OF A TYPECASTING MACHINE

(The phenomenon disclosed below opens up a new field for investigation, particularly for the verification of the data here set forth. Readers of this paper are doubtless prepared for such a climax—the mental urge resulting from the valuable contributions to these columns bringing a response from a most unexpected quarter.—Caught by our own recording machine.—The Editor.)

Hear a wonderful thing, and marvel!

I am called a Typecasting Machine, and I have been standing quietly at rest after a year of labor. All tasks are done, or set aside. Every human has gone; the Old Year himself is going. There are no sounds about me save the counting of the clock, as it lifts a finger toward the zenith of its tired face.

For me it is a wonderful moment. I have an impression of mystical influences abroad, of the liberation of strange forces in nature, and I sense the approach of an exalting experience.

I become conscious that I am no longer a machine—a melting pot, a matrix container and a multitudinous assemblage of parts. No,—I am an organism—

the close associate of man, long thinking his thoughts after him and serving him with every mechanical function, but denied one gift. And now—at last—comes to me this great miracle and boon—the endowment of speech!

From frictionless service to the incandescence of thought, from thought to the blazing joy of words, and one big moment of time by the clock—what then? . . . A TOAST!

I am a newcomer on the premises of the Journal, although fast getting over the strangeness of it and learning to talk in the noisiest of Pica and to run about all the cuts in the place. While I am minded not to take liberties (for these Westerners might lead me with a slug, or otherwise indent me, in which case there would be a lay-out, a lock-up and a hang-over the affair), still I venture this much:

With good will: Here's a Happy and Prosperous—to you personal units of the splendid organization which is producing the Journal! You are Going Good. One learns to think in myriawatts of cerebral energy through the stimulus of you; one ceases to be a machine—one escapes the duress of moulded metal and for a time, at least, becomes vocal with joy!

Not only the men of the electrical industry but the women as well are capable of riding Pegasus. The following eloquent tribute was written for the occasion of the Christmas dinner of the General Electric Company's sales organization in San Francisco by Miss Marion R. Dewey, and was read by M. C. Hixon.

TO FRANCE

Long past, when Freedom called across the seas,
A son of thine, O nation of our heart,
Sprang to the cry and pledged his blood to ours.
We shrined him in our soul, our Lafayette
And thine; as thou today to thy heart dost take
Our greatest and our noblest—he, our chief.

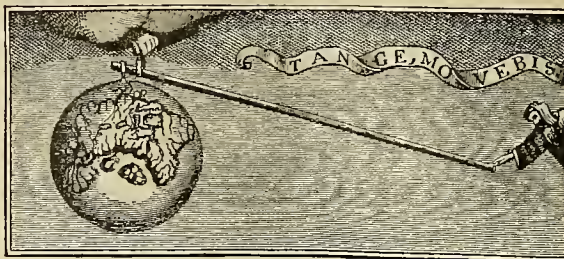
Yet not alone for ancient friendship's sake
Our men have died with thine on ruined fields;
And not for early generous aid alone
We honor thee. Still a greater debt we owe,
Thou matchless paladin of a cause supreme!

Thou didst reveal to a world new-roused
The awful splendor of the heights of sacrifice
That none except the greatest know. O France,
Thou fought'st hell like an angel—clear-souled, unsmirched
Free; though tortured to the utmost, conquered never.
We honor thee through tears, who gave to man
The inspiration of thy deathless self,
Thou flaming soul of a world set free!

MARION R. DEWEY.

ENGINEERS OF YESTERDAY

(A series compiled by A. L. Jordan)



1.—ARCHIMEDES

If all the earth thrown up in trench-digging in all the wars were placed in one heap, could one man lift it?

Archimedes, a Greek who lived in Alexandria (about 200 B.C.) claimed that with a lever long enough, he could lift the earth itself. He also discovered the principle of buoyancy, the endless screw to lift water (the forerunner of the electric pump), the principle of the center of gravity, and invented a concave mirror to focus the sun's rays upon the enemy's ships and set them on fire.

In This Issue: Scientific Salvage for Power Companies

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JOURNAL OF ELECTRICITY

VOL. 42 NO. 3

SAN FRANCISCO, FEBRUARY 1, 1919

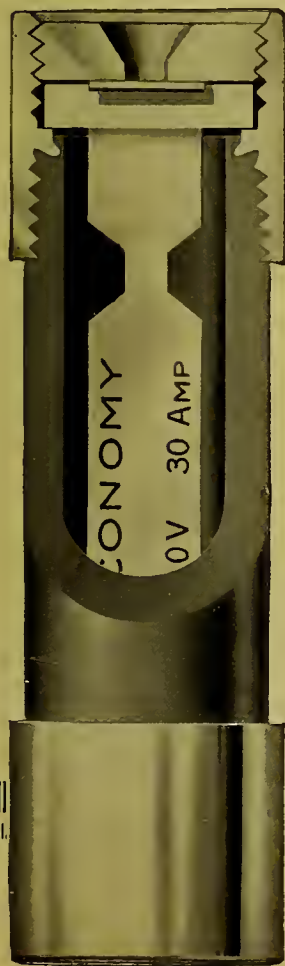
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Buy by brand. Specify ECONOMY—not just "fuses"

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Kinzie and Orleans Sts. CHICAGO, U. S. A.

*Sole manufacturers of "ARKLESS"—the Non-Renewable Fuse with
the 100% Guaranteed Indicator*

ECONOMY FUSES ARE ALSO MADE IN CANADA AT MONTREAL

For Unusual Peak Loads

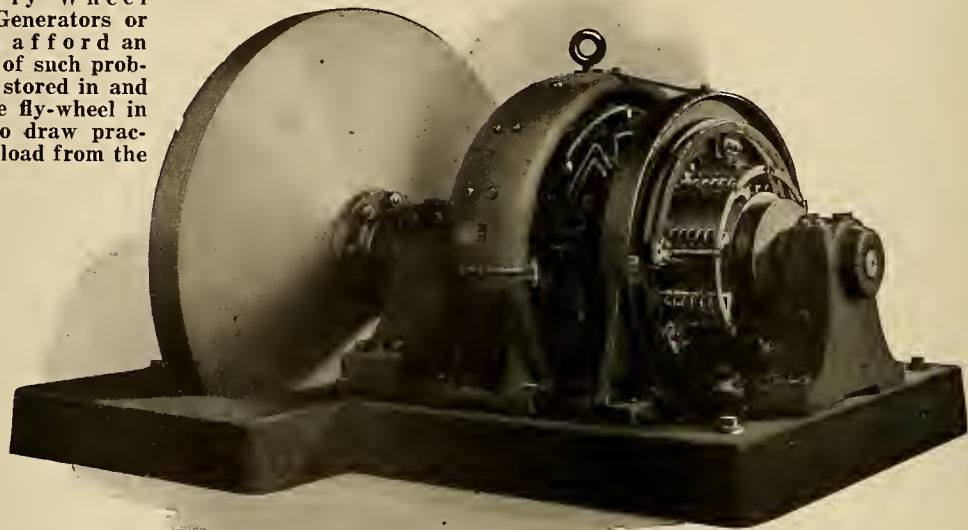
INTERMITTENT peak loads, caused by hoists, coal or ore unloaders and similar machinery, usually create considerable disturbance in the power station and often require generating equipment greatly in excess of the economical requirements of the load.

Allis-Chalmers Fly Wheel Equalizing Generators or Motor-Generators afford an effective solution of such problems. Energy is stored in and discharged by the fly-wheel in such a way as to draw practically a uniform load from the line.

The huge unloader shown below was installed on the Erie R. R. ore docks at Cleveland, Ohio, doubling the capacity of these docks.

With an Allis-Chalmers Fly-Wheel Equalizing Generator, floating on the line and smoothing out the peaks, this dock handles twice the tonnage of ore with less generating capacity and with improved regulation and economy.

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

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NUMBER 3

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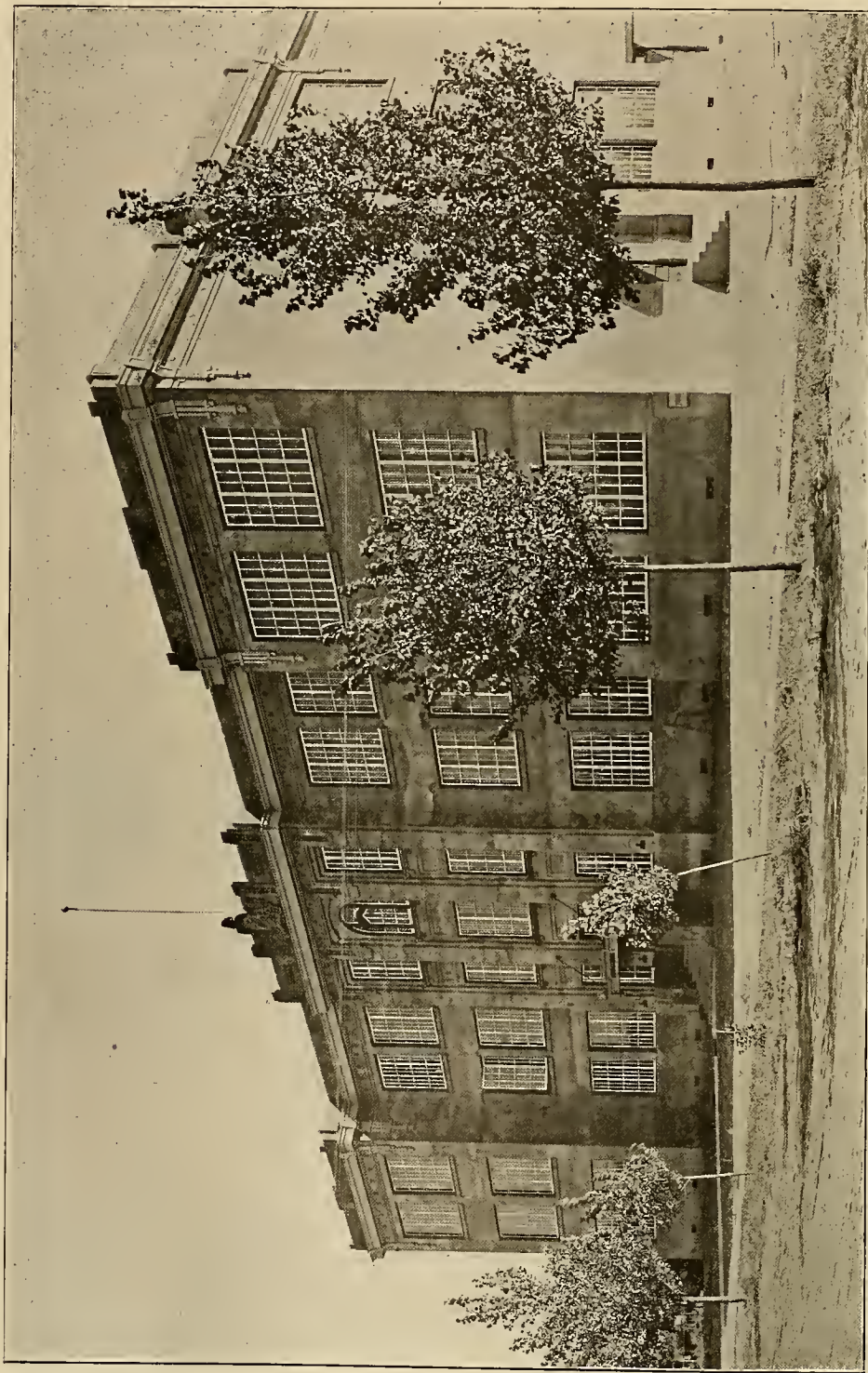
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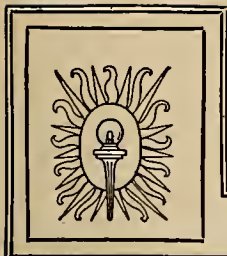
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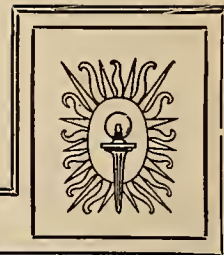
THE GREAT NORTHWEST ADDS NEW RECORDS IN ELECTRICAL ACHIEVEMENT

Here is an exterior view of the Burley High School, situated on the Minidoka Project in Idaho, where buildings are heated electrically to an extent accomplished nowhere else in the world. This particular building contains approximately 700,000 cubic feet of space divided into 31 rooms and offices. The heating plant is very complete. It is provided with tempering

and reheating coils, air washer and humidifier, and of course has an electric fan to aid circulation of air. The whole installation is automatically controlled by thermostats to keep a uniform temperature in each room. The heating plant has a capacity of 700 kw. but during the three winters since its installation the greatest demand has only been 350 kw.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, FEBRUARY 1, 1919

Number 3

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"SPREAD DAH NEWS THROUGH FRANCE" was what the negro sergeant, as he stood in the second line trenches, said he would do if he saw the Germans breaking through the first line system of defense. With the most wonderful period of development for the electrical industry immediately ahead ever experienced in the history of the great West, this is no time for pessimism, for the grouch or for one disappointed in love. Spread the news everywhere.

The Minidoka reclamation project in Idaho has ever held the attention of men of the industry since its early stages of installation, for this project combines reclamation of arid land and the electrical pumping of water upon lands not reached by the gravity system of supply, to a degree not hitherto accomplished elsewhere in the world.

A New Record in Electric Heating

Readers of the Journal of Electricity have on many occasions in the past read in these columns economic data on this development project—how the water is diverted, how this diversion dam is utilized for developing hydroelectric power, and how this self-same power is later used to pump water from the irrigation canals upon vast areas that would otherwise be compelled to remain in their arid condition were it not for electrical pumping.

Now comes another world-beating feat of accomplishment in connection with this scheme of development. The surplus electric power developed at the diversion works is being used for electric heating in a manner that makes a new advance in the electric heating art. This electric power is supplied most efficiently and economically to settlers upon this project, situated in a district where ordinary fuel is difficult and costly to obtain and where winter months often prove severe in temperature.

The electric heating load of this remarkable institution totals 5500 kw., creating a record for power totals of this nature. Another power company, formerly known as the Great Shoshone and Twin Falls Company, now the Idaho Power Company, ranks second in the United States by carrying this form of load to the extent of 3500 kw.

Electric heat, as referred to in this editorial and in the article appearing elsewhere in this issue concerning this record-breaking accomplishment in Idaho, applies only to the electricity used for heating buildings. The electricity which is used by these companies for cooking, water heating and other similar ways is placed in an entirely different class.

It has recently been shown at a hearing before the Public Utilities Commission of Idaho that electrical energy can not be sold at a rate which will permit house heating by electricity at costs reasonably comparable to those of coal, except only in those cases such as the Minidoka—where abundant hydro-

electric energy would lie idle otherwise during the long winter months. In view of this fact the article appearing elsewhere in this issue on the electric heating load of the Minidoka will prove unusually interesting and instructive.

The reports of new building permits throughout the West still continue far below normal. Investigation shows, however, that this is due to no feeling of pessimism, but rather to the natural lag necessary between diversion of the thinking mind from intense wartime activities to problems involving home building and expansion of business to meet the needs of readjustment, and especially to catch up, as it were, with building operations discontinued due to urgent representations of the War Industries Board.

The Home Building Outlook

Statistics show that in normal years, for instance, 350,000 residences are constructed per year in the United States. During the war period this has fallen so far below normal as to produce a shortage of 700,000 residences. This means that building in the United States must produce this 700,000 residences before normal conditions are reached in addition to 385,000 residences annually to meet the usual increase in population.

In the West, where the urge of youth and the spirit of a budding empire impel men to exert keener endeavor than elsewhere, this building period ahead is now being planned for with unusual care by all those far-sighted men who have in the past had a constructive share in its wonderful growth.

To the electrical man the home building era ahead has unusual fascination. There is no question but that the idea of the electric range, the electric toaster, the electric iron, the electric heating pad and countless other electric appliances for the home has already been sold to the public so effectively that the new home of the immediate future will be so generously wired and equipped for applications electrical as to make the home in the city and upon the farm in the West one beautiful, useful, economic and charming triumph in the application of the unseen energy from our great water resources that are already used to a degree equaled nowhere else in the world.

The California Railroad Commission, in its recent approval of the application of the Southern California Edison Company for authority to issue sixteen millions in new securities during the coming three year period, makes for itself the distinction of first place in commission service in the West in the matter of setting in motion much needed financial assistance for new power development work.

The Commission's order authorizes the company to issue \$8,000,000 of twenty-five-year 6 per cent general and refunding bonds to take up a like amount of short time bonds maturing July 1, 1919. Also the company is authorized to issue \$8,000,000 serial 7 per cent debentures, maturing in from one to ten years, to meet bills payable amounting to slightly over six million dollars, representing construction work. The bonds are to be sold at not less than 93% and accrued interest.

This large amount of new securities will greatly facilitate additional construction work and give added confidence throughout the West, in that relief is thus acquired for a large quantity of short time paper that has accumulated during the war period. As this splendid new security issue and authorization becomes more widely known in financial and utility circles unquestionably it will be one of the factors that will aid greatly in forwarding to even further limits the already marked prevailing tone of optimism that exists in these circles throughout the West.

It is interesting to note that the magnificent effort made in the West to increase the production of crude petroleum during last year met with ready response from all quarters. Nowhere else in the nation did the oil fields increase production to the degree that was accomplished in California. Indeed, the great Oklahoma-Kansas fields, the largest producers in the nation, actually dropped off in production from 155 millions of barrels to 139 millions, while California increased its production from 94 millions to 101 millions.

This enormously increased production enabled the country as a whole to put out a vast total of 345,500,000 barrels in 1918 as opposed to 335,310,000 barrels in 1917. According to statistics from the U. S. Geological Survey, the output in 1918 includes no less than 6,500,000 barrels of crude oil removed from field storage but excludes drafts aggregating 20,500,000 additional barrels from stocks of pipeline companies. The surface reserve of crude oil held by oil producers and pipe-line companies in the United States at the end of 1918 is estimated at 123,000,000 barrels, compared with 150,000,000 barrels at the end of 1917. These figures show that the demand for domestic petroleum in 1918 amounted to about 366,000,000 barrels. The exports of crude oil, most of it to Canada and to northwestern Mexico, aggregated about 5,500,000 barrels, leaving a total of 360,500,000 barrels available to supply domestic needs. This quantity was insufficient, however, and

about 36,500,000 barrels was imported, nearly all of it from Mexico, to meet the domestic requirements, which amounted in all to about 397,000,000 barrels.

The increase in output was made in response to a steadily growing demand for petroleum, expressed in advancing prices for crude oil, which were stabilized, with Government approval, at record levels during the closing months of the year. These high prices of fuel oil have had the effect, however, of causing considerable investigation in the West looking to the use of fuel substitutes. As a result it is to be expected that the near future will witness the development of the use of powdered coal and pulverized fuels to an extent that will materially affect the use of fuel oil in steam electric generation.

There is much interest at the present time in proposed legislation looking toward the licensing of engineers in several commonwealths of the West. Wyoming, a state that has so excellently taken the lead in handling of its water appropriations for many years past, has during this same period had a system of licensing its engineers, largely by having them pass oral and written examinations. The system as a whole has proved satisfactory.

In California during the legislative sessions of two years ago a bill was proposed by the architects that was bitterly opposed and finally defeated, due to the efforts of the engineering fraternity as a whole, for it was felt that the architect was attempting to limit the scope and activity of the engineer to an unjust degree in regard to structural matters wherein the engineer is admittedly the authority in design.

During the present session of the legislatures in various commonwealths of the West it is possible that bills will be introduced which will touch upon this important subject. It would seem that the whole movement has merit, if it succeeds in passing legislation that will tend to prevent the so-called "curb-stone" engineer from attempting to practice the engineering profession and thus insure to the public the confidence in the profession commensurate with the dignity and high ethical standard now maintained by the profession as a whole.

In the matter of fees for those engineers from without the state who desire to practice within its confines, care should be taken that no unreasonably large fees be exacted, as it must be remembered that a number of our most noted engineers are now practicing in many different states. Hence retaliatory legislation may make such fees unjustly burdensome or foreign to the spirit of the movement which is to protect the standard of the profession rather than to legislate against any particular class.

The entire matter of licensing engineers is now receiving careful consideration by practically every group of the profession so that it is believed that such legislation as may be enacted will be accomplished only after most careful scrutiny and overhauling by those most capable to judge of its possible influence for the good of the profession.

One of the big factors that has always been present to attempt to retard the industrial growth of the West is the almost total lack of iron production in this vast district. Readers of the **Journal of Electricity** are familiar with the long series of investigations undertaken at Heroult, California, and other instances wherein definite progress has been made in the method electrical for the smelting of iron ores.

It now appears that another mile post of progress is to be reached in the smelting of iron ore at Seattle. In this enterprising industrial district, the Smelters Steel Company is constructing a plant on the Commercial Waterway for the smelting of iron ore from its mines in British Columbia. The company is to install four electric furnaces which are to have a total capacity of thirty tons of output in high grade gray iron per day. The furnaces are to be of the arc type with one electrode to each furnace. The ore is an iron oxide and the company is said to have abundant flux necessary for its smelting purposes near the mine.

The use of the electric arc in the smelting of iron ore is fast passing the experimental stage, and the fortunate location of vast iron ore deposits in many sections of the West, where potential possibilities for hydroelectric development reach gigantic proportions augurs much for the continued industrial development of the West, especially in those industries where iron and steel play an important role.

The successful outcome of the war and the tremendous part played by electricity and by men of electrical engineering profession have again stimulated an interest in this industry never before realized even in its many successful years of the past. Although some of this interest may be attributable to a passing fascination for the brilliant accomplishments of the war, those who look deeply into the subject realize that this interest has a far deeper significance. In a word, it is unquestionably the result of a growing conviction that no matter what direction renewed activity may take, electricity is bound to play a leading and indispensable part in world reconstruction.

And this is why students are indicating a leading preference for electrical engineering in the great colleges and universities of the West. Take as an instance the University of California. A recent survey made by the university authorities among the student army training camp indicates some interesting forecasts. Statistics show that approximately 58 per cent of the 388 freshmen who expect to con-

tinue college work will pursue technical courses. The greatest number of individuals expect to enter the College of Commerce; electrical engineering is next; chemistry third; and agriculture fourth.

The vision of industrial and commercial development at home and abroad, combined with the necessity not only for a thorough business training but also a training in the fundamentals of a specialty, seems to be the urge that is leading these young men in their choice. And in this choice thoughtful men cannot help but concur.

Considerable comment has been made lately concerning the purchase of Lower California from Mexico. From the viewpoint of an investment some scheme whereby stability to development of this peninsula may be assured is much to be desired. While the country is arid and at present practically worthless, unquestionably its scientific development, with tremendous financial resources available, would result in much good being accomplished in reclaiming a large territory for the use of man that is now of little value.

To the development of major engineering operations along the Mexican border in California and Arizona the purchase of this tract so as to include both sides of the Colorado river would be very helpful at this period. The Imperial Valley and other arid districts along the southern border are dependent upon this river for water and power, and in this utilization the rights of the Mexican government come in for consideration. Looking at the problem from the broadest humanitarian viewpoint possible—namely, that viewpoint that would bring about the greatest utilization for all the territory involved—if some amicable arrangement can be arrived at whereby this entire territory, both Mexican and American, can be developed without friction and with assured stability of government, such an arrangement would mean much for the continued and unhampered commercial and engineering development of the great West and the lands bordering the Pacific.

We only have to look to Alaska as an instance of possibility of development under a strong and firm governmental hand and then compare with it Siberia, its neighbor. Siberia is admittedly a country teeming with resources and opportunities for man and yet the very instability of government has delayed its development fully fifty years. Alaska, meanwhile, a former territory belonging to Russia, has under its fifty years of ownership by the United States produced in mineral ores alone—gold, silver, copper and other products—nearly a half billion dollars.

THE NEW JOURNAL SERVICE: The pronounced demand for ideas looking toward renewed business building activity has led the Journal of Electricity to devote the leading features of the issue of February 15, 1919, to the electrical contractor-dealer in his work in large business buildings. To this end articles setting forth electrical equipment and special convenience appliances for large office buildings and department stores will be featured. Another feature will be an article by H. A. Lemmon on advertising that to the salesman will prove intensely interesting and helpful.

Taken as a whole these features, combined with the splendid ideas and suggestions from the California Electrical Cooperative Campaign that will appear in the next issue of the Journal of Electricity, should prove unusually stimulating and helpful in renewed activities of the contractor-dealer that are beginning to be felt in many quarters.

ELECTRIC HEATING AS A PROFITABLE LOAD

BY BARRY DIBBLE

(The following data on the cost and revenue of electric heating on the Minidoka Project, Idaho, were prepared at the request of the Idaho Public Utilities Commission—and very graphically point out the possibilities in the heating load for the power company with an irrigation demand for the summer months. The author is project manager of the U. S. Reclamation Service in this district.—The Editor.)

The developments in the commercial use of electric energy on the Minidoka project of the U. S. Reclamation Service are the outgrowth of the rather exceptional conditions under which the power system was installed. The generating station itself was built primarily to supply power for irrigation pumping on the project. It has a rated capacity of 7000 kilowatts, and a maximum of about 7800 kilowatts. Practically all of this is required in the summer for pumping. It was anticipated that with the development of the project a demand for electricity would be created in the towns and rural communities both



THE U. S. RECLAMATION OFFICE AT RUPERT

With a pumping load almost entirely confined to the summer months, the taking on of a heating load in the winter has here proved commercially practicable. Small houses and large—on this project all are electrically heated.

for domestic use and for manufacturing, but it was realized that the growth of this ordinary load would be comparatively slow and that it would be many years before these requirements of the towns would be an appreciable part of the capacity of the powerhouse. As a matter of fact the ordinary commercial load on the Minidoka system has now, after ten years, reached a maximum demand of only 750 kilowatts or 10% of the generating capacity, although the lamps, motors and appliances connected to the commercial lines of the system would, if all used at once, require 3478 kilowatts.

A Winter Load Needed

Under these conditions it was deemed expedient to find some other and more unusual load so that the powerhouse might be efficiently operated throughout the year. At the time this subject was under consideration, in 1909 and 1910, the Great Shoshone and Twin Falls Water Power Company, operating in the territory immediately west of the Minidoka project, was carrying out with some success experiments in electric heating for dwelling and other buildings. This electric heating load appeared to be

the only one that could be secured that would satisfy the conditions of the Minidoka system. These permitted of carrying a heavy load in the winter but required that the demand be reduced to practically nothing in the summer. It was necessary that the extra investment required should be moderate and it was desirable that the benefit from the use of this power should be widely distributed among the population and result in conservation of the natural resources. It was apparent that electric heating would have to be supplied at a price very much lower than the customary rates for electricity in order that it might supplant coal, in fact the rate must be much below the average cost of supply. However, in supplying electricity for heating, use was made of a power station that was already installed and operated for other purposes, and a transmission line which was needed to supply the ordinary requirements of the towns. Therefore the additional expense of carrying the heating load was confined to the extra substation equipment required by the Reclamation Service and to the additional copper and transformer capacity needed by the retail company in the distribution of electricity to the consumers, together with an allowance for bookkeeping and other operating expenses caused by the extra business.

Within a few years the heating load has increased to such an extent that it was necessary to build a duplicate transmission line about 13 miles long at an expense of over \$11,000.

Of late years the demand for electric heat has increased rapidly until during the calendar year 1917 the substation in Rupert (population about 2000) carried a load of 2000 kilowatts, while that in Burley (population about 3500) carried 2500 kilowatts, of which heating accounted for over 90 per cent. There was also some heating load on other substations. The maximum heating demand during 1917 was 4707 kilowatts. The point has now been reached where any material increase in the heating load will require a corresponding increase in the copper in the present transmission lines.

Estimating Cost

An effort has been made to estimate the cost of supplying electricity for heating in the towns on the Minidoka project. In doing so figures for 1917 are used as this is the latest period for which complete data is available. Two methods of computation are used, the first to arrive at the additional expense caused by the heating load; the second to determine the charge that the heating service would have to bear if it were to carry its proportionate share of the costs of the entire electric system. In this connection it should be explained that the Reclamation Service in general acts as a wholesaler of electric energy. It generates, transmits, and transforms the

energy, delivering it to distributing companies at the switchboards of the substations. Therefore the costs shown below carry the electricity only to the substation switchboard. The retail company, or distributor, carries the additional burden of costs required to serve the consumer. At best these costs can only be approximations, because of the many factors that enter into any discussion of this cost and the many more or less arbitrary assumptions that must be made, where a determination is attempted



THE HIGH SCHOOL AT RUPERT ELECTRICALLY HEATED

The substation at Rupert during 1917 carried a load of 2000 kilowatts, of which heating accounted for over 90 per cent.

of the costs entering into the carrying of one particular class of business. No attempt has been made to split hairs, but it is believed that these figures give a fairly accurate idea of the conditions they are intended to explain under the particular conditions that are involved.

In the first case it is assumed that no additional expense at the power house is necessary because of the heating load; in other words, that the power house must be operated to supply lights and other ordinary appliances in the towns, that no additional attendance is necessary because of the operation of extra units; that the additional oil and supplies required are negligible and that extra wear and tear on the units due to operation is not greater than the deterioration that would occur if some of them were idle and one were in operation at fractional load. Therefore no charge from the power house is made to the electric heating service. It is further assumed that the electric heating should bear an expense on account of the transmission lines proportional only to the additional investment in lines that was made necessary because of the heating load. This covers the line referred to previously. For the year 1917 this represented 29.6% of the total charged to commercial power system for transmission lines. As for the substation, it is assumed that the operation (including ordinary inspection, meter reading, etc.) would have been about the same for a small station as for a large one. Therefore no charge is made to the heating service for this item. However, the cost of repairs or maintenance and the depreciation are materially increased because of the greater transformer and switchboard capacity installed to take care of the heating load. It is assumed that these charges should be divided in proportion to the "light and appliance" and "heating" peaks of the

year. This makes the charge to the heating service 84.6% of the total. There is a considerable item of expense in conducting the sale of electricity due to bookkeeping, reading meters, taking care of complaints, soliciting new business, etc. This cost is here divided in proportion to the revenue from the different classes of business.

Following the above outline, the additional cost to the Reclamation Service of the electric heating business is as summarized in Table I up to and including the delivery of the energy to the distributor at substation switchboard.

TABLE I
Additional Cost of Supplying Electricity for Heating During Calendar Year 1917

	Total	Per Kw. of maximum demand
Powerhouse	None	
Transmission lines:		
Operation	\$158.80	
Maintenance	251.60	
Depreciation	1080.00	
Sub-total	\$1490.30	\$0.32
Substations:		
Operation	None	
Maintenance	3754.63	
Depreciation	2030.00	
Total	\$5784.63	1.23
Sale of Electricity	2037.40	.43
Total	\$9312.33	\$1.98

In this connection it may be said that the average revenue of the Reclamation Service from the sale of electricity for heating service was \$3.78 per kilowatt for the year 1917. Thus, neglecting all costs except those additional ones listed in Table I, the electric heating business showed a surplus of \$1.80 per kilowatt for the year. This is equivalent to a return of 13.0% on the extra investment required. This surplus is available to cover such charges as insurance, interest on the investment and, in the case of a private company, taxes. If this surplus is figured as a return on the total investment in the power system in the proportion that it is used, the rate of return becomes only 3.3%.

No concern could operate long if it omitted from its computation of costs all items except the additional ones incurred in handling a particular line of business. It has been the practice of the Reclamation Service to prorate all expenses as nearly as may be to the feature benefited. Thus, the power house costs are divided in proportion to the number of kilowatt hours delivered for various uses. During 1917 there were delivered 38,500,000 kilowatt hours on the Minidoka system of which 19,700,000 were used in the Government pumping plants, and 18,800,000 were sold. Of the latter nearly 15,800,000 were used for electric heating. In the case of the transmission lines at the end of 1917 there were 26.8 miles in the system that had been erected primarily to reach the pumping stations and 46.6 to serve the commercial consumers. The total costs are divided between the pumping and power units in proportion to this mileage. It then seems logical to divide the charge to the power system so that the heating service will carry an amount proportionate to the kilowatt hours used for that purpose. In table II the substation costs and the expense of handling the sale of electricity are also divided on a kilowatt hour basis.

TABLE II

Cost of Heating Service Based on Average During Calendar Year 1917		Cost per Kilowatt Hour	
	Total	Per kw-hr. of maximum demand	Per kw. demand
Powerhouse:			
Operation	\$ 5750.00		
Maintenance	1561.46		
Depreciation	6123.24		
Sub-total.....	13,434.70	0.00083	\$2.86
Transmission lines:			
Operation	464.09		
Maintenance	735.15		
Depreciation	3167.60		
Sub-total.....	4366.84	0.00027	0.93
Substations:			
Operation	1117.22		
Maintenance	3842.63		
Depreciation	2078.00		
Sub-total.....	7037.85	0.00043	1.49
Sale of Electricity.....	4795.40	0.00030	1.02
Total.....	\$29,634.79	\$0.00183	\$6.30

In both tables I and II the annual depreciation charges are arrived at by using the following percentages of the first cost:

Powerhouse—	
Structure	2%
Equipment (average)	4.7%
Transmission lines—	
Poles and fixtures.....	12%
Wire	2%
Substations—	
Structures	2%
Switchboard and cables.....	8%
Transformers and all other items.....	5%

It should be noted that if there had been no summer irrigation load on the power house against which could be charged practically half of the annual expense, then the heating load would have had to bear approximately twice the power house charges shown in Table II. This would have a very material effect on the entire situation. Indeed in such a case, the investment in the power house could not have been justified if the major portion of the installation had been made only to meet this demand.

The Methods of Proportioning Costs

It is realized that many different methods of dividing costs might be followed in arriving at a figure for the electric heating service and it is probable that arguments both for and against each of the methods could be made. It has long been recognized as a principle of rate making that if a system is underloaded, it is justifiable and good business to take on a load that will more than pay the extra expense that it entails. Such a load, while it may not carry its pro rata share of the cost, at least helps in some degree to meet the fixed expenses that otherwise would have to be met from other sources. However, it is logical to expect and require that a load which can not afford to pay average costs should at least contribute all it can afford to the expense of operating the concern. In order to arrive at what this contribution might be in the case of the heating load, it is interesting to compare the cost of coal and electricity on a heat-unit basis. Available coal may be roughly assumed to contain 12,000 B.t.u. per pound or 24,000,000 per ton. After allowing for losses in heat that goes up the chimney, unburned coal in the ashes, waste due to holding the fire longer than needed, and to slacking in the coal pile, it is probably liberal to assume an efficiency of 33 1/3%. In other words, only 8,000,000 B.t.u. will be effec-

tively used per ton of coal. One kilowatt hour of electricity is equivalent to 3416 B.t.u. and a kilowatt month to 2,459,530 B.t.u. One hundred per cent of the electrical energy delivered to the heating device is converted into heat. In Idaho it is customary to sell electricity for heating on a flat rate per kilowatt of demand for the month or season. The consumer cannot use his electric heat effectively every hour of the day nor every day in the month. On this account the efficiency of use of electricity for heating probably runs around 66 2/3% or perhaps it would be better to consider that the load factor would be 66 2/3% if the electricity were switched off when not needed. This would make the effective heat per kilowatt of maximum demand 1,640,000 B.t.u. per month. In other words one ton of coal per month is equivalent to 4.9 or say 5.0 kilowatts when used for heating. This is borne out by experience on the Minidoka project. Thus electricity at \$1.60 per kilowatt of maximum demand is on an equality with \$8.00 coal.

The increased cleanliness and convenience of electricity is a factor that should be taken into account. If it is assumed that because of this feature the consumer will pay 25% more for electricity than he would have to pay for coal, the indications are that electricity at \$2.00 per month per kilowatt will compete with coal at \$8.00 per ton. It has been found on the Minidoka project that the average season for the heating load is from five to six months. In other words, the total consumption of electricity for heating is equivalent to five or six months' continuous use of the maximum demand. Therefore a retail revenue can be expected from this business of from \$10.00 to \$12.00 per kilowatt per season.

It will be understood that the figures given in the foregoing paragraph are for average conditions in the territory served by the Reclamation Service on the Minidoka project in Idaho. In a particular case even within this territory the results may vary materially from the average because of the type or size of the heating plant or the care and skill with which it is handled. In general, the smaller the building the more economical is the use of electricity.

Maximum Demand Basis for Charges

It is sometimes suggested that electricity for heating should be sold by meter at a kilowatt hour rate. This would undoubtedly reduce considerably the kilowatt hour consumption. However, it will be apparent without discussion that the cost of supplying this load depends upon the maximum demand rather than upon the length of time the demand is used. At best there is very little diversity in the demand. When the weather is cold every one wants the heat at the same time and equipment must be provided to care for this condition. The revenue per season must be the same per kilowatt of maximum demand and therefore the reduction in kilowatt hour consumption on a metered basis would have to be met by a corresponding increase in the rate. In fact, when electricity is sold on a maximum demand basis the tendency is to keep down the peak load by closing some rooms in extremely cold weather. On

the other hand, if it were sold on a kilowatt-hour basis, consumers would undoubtedly be inclined to put on some additional heaters for the cold weather and this would increase the necessary power equipment required. As the use of this additional equipment measured in kilowatt hours would be slight, the average rate would actually have to be increased to cover the extra costs.

In conclusion it should be emphasized that the

data given above apply only to the peculiar conditions prevailing on the Minidoka project and cannot be safely applied to other power systems. It can be said that electric heating is sometimes justified as a "by-product" load, but that rarely if ever will it be economically feasible to develop electricity from water power for the prime purpose of using it generally to heat buildings where fuel can be obtained at reasonable prices.

SCIENTIFIC SALVAGE

BY H. N. SESSIONS

(Salvaging waste materials is clear gain. The system of army salvage has become one of the essential elements in the conducting of the war—and the problem is one of peace as well. How the clearing up of the junk pile in a power company's organization can be made a source of profit rather than an expense is here interestingly told by the commercial engineer of the Southern California Edison Company, who has directed the salvage work of that company. —The Editor.)

The Need for Thrift

To the public utility aiming to properly conserve its resources, the science of salvage is indispensable. The value of the science is not conspicuous to the uninitiated; however, one proficient in its practice sees the possibility of accomplishing astonishing results in the development of thrift to the highest degree by the central station. For lack of knowledge, the advantages of salvage are too often overlooked and its neglect actually lowers the efficiency and morale of each branch of an organization.

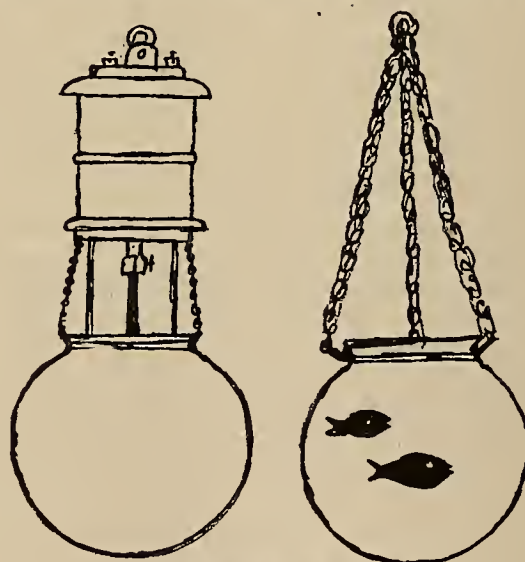
Bearing in mind the warning, "There is a withholding that leads to poverty," let us take for example and analysis a central station which for want of funds sees no possibility to purchase additional equipment—for instance, a needed new boiler or a fuel economizer—yet through force of habit or a false sense of attachment there is being unconsciously retained in possession miscellaneous inactive and obsolete material which could be salvaged, let us assume, for \$10,000, a sum ample to secure the necessary new equipment.

The Burden of Unsalvaged Scrap

What has the burden been to this central station in the holding of this idle, second-hand and obsolete property? The vain hope held out of applying it somewhere has kept it a subject of annoyance, costing the management's time and attention. Efforts to adapt it here and there have expended labor and material in moving and fitting. Because of its second-hand character there is a natural tendency to disregard its value; hence extraordinary depreciation occurs through careless handling. The expense of maintaining an accurate record and inventory of such stock is surprising. It has cost labor and valuable space to store. The interest on the investment and its insurance must not be overlooked. Its presence has marred and encumbered many a spot that would otherwise have a clean and business-like appearance. Take the loss to this central station through the withholding of these dead articles and compare it with the reward of resurrecting them by salvage, in the form of ten thousand live, hard-working dollars. Besides, isn't it much nicer in every respect for the treasurer to hold in his money

drawer this extract of all the good there can be in these things?

Because the necessity of salvage does not stare the central station manager smack in the face as it does the commander of the ocean greyhound, the former is often distressingly ignorant and the latter particularly wise and efficient in this respect. The service of the ocean liner is perfect service or no



A CONVERTED ARC LAMP

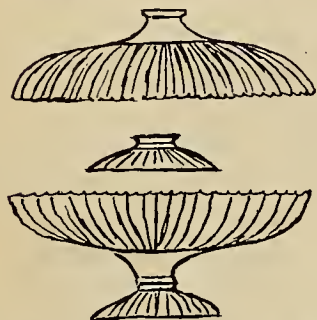
More profitable avenues for salvage than the junk dealer are to be found. It was discovered, for instance, that the globes to old arc lamps could be sold to a certain Japanese dealer for use as fish bowls.

service and perhaps peril, unless through salvage the boat is kept in "shipshape." The central station manager who says, "Don't waste my time on salvage, I have other worries," soon finds his property in an unthrift and unhealthy condition. It is time he awakens and redeems his superfluous property, whatever and wherever it may be, into cash; and it might at the same time be appropriate for him to apply this wholesome exercise on himself by turning fat into muscle and languor into pep. It is not peculiar, therefore, that the central station neglecting salvage is usually found weak otherwise, and particularly so in the collection of its accounts; for the salvaging of delinquent bills earns many a dollar by saving it from loss through bad debts.

Better Markets Than the Junk Man

The salvage expert knows no such word as "waste." From Nature's law of compensation, he realizes that nothing can be destroyed. He knows that if equipment or material has lost its usefulness for one purpose, it is still either in part or whole valuable for another purpose, and to discover this use he has the pleasure and the interesting task of exploring many trades and industries and he is handsomely rewarded in the discovery of markets far better than the junk syndicate.

With the knowledge of how scrap can be used and sold to the best advantage, the matter of salvage



In this case by uniting two discarded shades, an attractive punch or fruit bowl is achieved. The man who achieves this result can afford to pay the power company for the glassware more than can the rag-bottle-sacks man.

can be made one of simple merchandising. The salvage salesman, however, is not welcomed with gracious arms. Running up the selling price of an obviously rundown article is no snap. Success rests entirely on his knowledge, diligence and ingenuity. It is human nature to take interest in the purchase of something new and just as natural to lose interest in what becomes of something old; hence the work of the salvage agent is necessarily more difficult than that of the purchasing agent.

The Way the Southern California Edison Does It

The Southern California Edison Company, in its recent consolidation with the Pacific Light and Power Corporation, the Mt. Whitney Power and Electric Company and other smaller concerns, found itself possessed of a very considerable amount and variety of duplicate and surplus machinery and equipment and, fortunately, because of its organization on salvage, almost all of this has already been disposed of at war prices. Salvage of this did not altogether mean sale, as in some cases worn machinery was reclaimed by the interchange and substitution of parts, while other material was retreated for use again. This property consisted of buildings, tents, furniture, utensils and provisions, live stock and wagons, hospital apparatus, railroad equipment including steam locomotives and cars, mining machinery, gasoline locomotives, automobiles, steam shovels, rock crushers, cement mixers, hoists, derricks, steel tanks, cable, chain, pipe, tools, etc., in fact, almost every conceivable machine and material used in the construction and operation of hydro, steam, compressed air, gas and electric plants. The majority of this property was sold as usable equipment directly to the actual users at prices in some cases even above its original cost, due to the scarcity and demand caused by the war.

Sorting the Material

The culling of scrap material requires considerable skill, watchfulness and judgment, particularly

in the grading of metals. After a pile of iron has been separated into cast iron, cast steel, wrought iron, various kinds of wrought steel, and from the whole are picked all pieces such as rods, tubes, sheets, etc., having greater value than pure rolling mill or foundry stock, then the matter of selling the remainder is simple. The U. S. Steel Administration had for some time fixed a minimum price on steel and iron and the mills and foundries engaged on government contracts, by agreement with the scrap dealers, accepted from them iron and steel at the maximum price; but as a protection to the dealers, the mills paid considerably less for iron delivered by outsiders. The Southern California Edison Company argued that it should be recognized as a dealer because of the thoroughness, etc., with which it had merchandised its salvage business, and the company therefore was taken into the fold of scrap dealers without protest and received for its scrap steel and iron the government's maximum price. During the full period of the government's maximum price of 26 cents on ingot copper, the Southern California Edison Company disposed of all its scrap copper at 25.75 cents, although copper was seldom sold elsewhere above 23 cents. This price was "bulled" by the salvage agent because of the scarcity and high selling price of red brass on the Pacific Coast at that time and also his knowledge that the founder could blend copper at 26 cents with zinc, lead and tin at their respective market values and yet compound ingot brass for even less than scrap red brass was selling for.

Some of the Markets

The exploration of the rubber industry found a market for auto casings at a price of from 8 cents to 15 cents per lb. and for all casings sold in 1918 an average of 11.6 cents was received. The junk trust's offer for auto casings was 5 cents. Inner tubes brought from 22 cents to 30 cents per lb. Discarded linemen's gloves changed hands at \$1.00 per pair, with the workmen handling injurious chemicals, such as storage battery electrolyte, etc. Lead glass from broken incandescent globes, etc., brought 6.5 cents per lb. Old manila rope, ordinarily priced at 4 cents, brought from 8 cents to 20 cents per lb. One market for this is in the lath mill, where it is unstranded and used to tie lath bundles. The obsolete holophane reflector was put to novel use as a fruit dish or punch bowl and, when mounted on a suitable base, is both appropriate and beautiful. Clear arc light globes were redeemed for more than first cost by a wise Japanese who knew more about hanging gold fish containers than electricity. Frosted and clear globes alike find a fitting finish with the nurseryman for the shelter and propagation of delicate plants. Obsolete marble switchboard slabs are indispensable to the confectioner and mighty handy for the housewife in fancy baking. Scrap leather belting brought from eighty cents to one dollar per lb., a good deal of it being run into tugs and other harness. These are a few reasons why the common practice of carelessly raking up a pile of so-called waste and touching a match to it should not be countenanced.

It frequently happens that the central station finds itself in possession of some particularly slow moving material; for example, junk sheet iron, which there is only an occasional market for. With diplomacy, this material can be gently "handed" to some one dealer manifesting unusual anxiety to purchasing something else, let us say in this case, steel shafting. The price should be stiffened on the shafting and the offer for sale made only contingent on the scrap dealer's taking the sheet iron, and the revenue from the entire sale may be so proportioned as to allow a fair selling price to be recorded for each item. By taking advantage of this practice of making strong stock sell the weak, a clean-up of low grade stuff can be accomplished, even to the point of making the removal of pure rubbish part of the bargain.

No Itemized List Published

The Southern California Edison Company has found by experience that to keep up and issue an itemized list of all its scrap and obsolete stock for sale is a mistake. Such a list stirs up for the salvage agent a lot of lost motion and unproductive correspondence from frazzled machinery dealers and curious, insincere inquirers. The most effective method of reaching buyers, the writer believes, is to constantly sound and spread the simple song, "The Southern California Edison Company has miscellaneous material and equipment for sale." Then in reply to a request for a list of it all, we answer, "We don't supply one, but give us your wants and conditions and they will have our immediate and careful attention." This calls for a "show-down," disclosing the possibility of a sale or not and salvages time. All property is offered subject to prior disposition, as it is, where it is, for cash on or before delivery. No options are permitted and no guarantees as to a machine's completeness or condition are given. The above procedure is derived from experience peculiar to the sale of second-hand machinery and effects the clean close of a sale without an after-math.

All inactive, surplus, obsolete material and equipment which becomes of no further use in a department or district of the Southern California Edison Company is forwarded to and concentrated in a clearing storehouse. If it is adjudged by a committee of five engineers to be of no further use elsewhere on the system, the chairman of this committee, the commercial engineer of the company, is responsible for its salvage to the best advantage.

A Central Station Clearing House Needed

Before the close of the war the Engineering Committee of the Pacific Coast Section of the National Electric Light Association appointed the writer chairman of a sub-committee on salvage, the purpose of this committee's work being to put in action the surplus and idle equipment of one central station by another, through loan, trade or sale. This idea of joint salvage by company members surely presents worth-while possibilities and to carry out the plan successfully, a central salvage bureau was thought necessary. As this was a war measure, although now in abeyance, it made for greater thrift

and in our economical adjustment of things, it should be given renewed attention.

Before the war our country was in a state of drunken prosperity, so much so, that some enterprises thrived notwithstanding that their extravagance and waste were utterly incompatible with legitimate business. The pressure of war retrenchment, however, crushed out those industries honey-combed with waste, and business that has withstood and survived the strain now finds itself toughened by thrift and down to fighting weight.

GETTING ACQUAINTED WITH YOUR COMPANY

BY R. B. MATEER

For a number of years educational opportunities have been tendered to the members of the quasi public utilities, by both the National Electric Light Association and the National Commercial Gas Association. Hand books, printed matter of exceptional interest and comprehensive courses in operation, accounting and salesmanship are offered to the student who desires a good working knowledge of gas and electric practice. The Philadelphia Electric Company has recently added to these opportunities for self-education by providing for its employes a series of lectures covering every phase of that utility's activities, to be given by the various heads of departments.

Unique in its inception, it is believed that the course as planned will not only result in the uplift of the members, but that the talks by the executives and department heads will "clear the mind of the fog caused by listening to the many versions of how the company's business is conducted."

The tentative program consists of twelve lectures, which will be delivered at the Department Branch Meetings of the Section. The talks, which will be followed by discussion, are:

- The Company
- The Secretary's Office
- Getting the Business
- The Station
- Transmission
- The Customer's Installation
- The Bills
- The Treasurer's Office
- The Paymaster
- Safety Engineering
- The Claim Department
- The Executives

It is believed that taking the employe into your confidence—acquainting him with the work of the other departments and setting forth the policies as determined by experienced executives, encourages loyalty to the company and inspires each member with an enthusiasm that is shown not only in his work but in his attitude and when in contact with the consumers. The loyal, enthusiastic member of any corporation is more than an employe—he is a partner and in proportion as his vision is broadened—so does his usefulness to the corporation increase.

CALIFORNIA COOPERATIVE CAMPAIGN PROGRESS

(Extracts from the report of the California Electrical Cooperative Campaign Executive Committee which show the accomplishments of 1918. A summary of the success of the work in spite of difficulties and plans for the future will be given in brief form in the next issue of the Journal of Electricity, together with comments on the work from men of the industry in the West.—The Editor.)

The object of this campaign is Better Electric Service to the Public, and, as the certain result of that service, more profit to individuals and companies in the electrical industry.

In the advance report of the Advisory Committee of California Electrical Cooperative Campaign, the progress of the last year is concretely reviewed:

Formulation of Principles

The basic idea which led to the institution of the campaign was that as the contractor-dealers are the natural salesmen of the industry, they should, as such, have the cooperation of the central stations and of the other branches of the industry in their educational work so that they may become even more effective in creating in the general public a greater desire for more electrical service. This was, in effect, the idea expressed, in turn, by a contractor-dealer, a jobber, and a manufacturer who, by invitation, attended the meetings of the first Commercial Committee of the Pacific Coast Section N. E. L. A.

The Advisory Committee at its first meeting in January, 1918, outlined in some detail the organization and the plans of the campaign and have closely followed that outline during the year. It contained the following statement:

"The Committee, in considering the plan outlined by the Commercial Committee and, also, considering more in detail the things which are to be accomplished, feels that the development of a closer cooperation and understanding between the central station employees and the dealer-contractors and their employees is an essential foundation to future development and educational work. It shall, therefore, be the Committee's object to bring about a better understanding of the duties of the contractor-dealers and of the central stations to each other, and to cause the individuals affiliated with every branch of the electrical industry to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry.

In answer to several questions that were raised during and after the get-together dinner at San Francisco, the Advisory Committee at their meeting on June 8th framed and adopted the following resolution:

"It is the policy of the Advisory Committee not to ask or urge Central Stations to go out of or to stay out of the business of selling lamps, appliances, etc., at retail to their regular consumers. It is, however, its policy to encourage the Central Stations to conduct their selling of appliances, etc., on an ethical retail basis; on a basis that will encourage the retail dealers of their respective territories to become more active and progressive as electrical retailers and contractors.

And at its meeting in San Francisco on August 2 and 3, 1918, the Advisory Committee adopted a further statement of policy as follows:

"Our policy is to develop our industry by educational methods, encouraging the practice of good ethical business methods and of improved service to the public. It is recognized that the practice of proper accounting, of other good business methods and of good business ethics will result in companies and individuals being able to ask for their goods and service a price that will include a fair profit, and we hold that such exchange of goods, service and ideas for profit is legitimate and ethical, provided that all parties in the exchange, including the customer, are benefited thereby.

It is expected that the adoption of good business methods will also so increase the efficiency of the various branches of the electrical industry serving the public that it will enable our industry to give the customer a better value for the dollar he spends for electrical service."

Some of the Things Accomplished

During the year 1918 the Field Representatives have spent considerable effort in increasing the membership of the Contractor and Dealer Association. New locals have been established at Modesto and Marysville, and now there is a local in practically every section of the state. A special campaign for new members was conducted in Southern California by which the membership there was increased over 50%. During the year, the association has been enlarged by 43 new members. In San Jose the dealers have been formed into a local association and may, in a body, become members of the State Association.

An important phase of the Field Representatives' work has been improving the relations between the managers and employees of the central stations and contractor-dealers. In the course of the year 410 calls have been made on 130 central station offices, the objects of the campaign discussed, and efforts put forth to bring about closer cooperation with the local contractor-dealers. A great many cases were found where an attitude of absolute indifference existed between the central station manager and the contractor-dealers, and some cases where the feeling was very unfriendly. Slight cooperation between these two branches of the industry was in evidence in a few places. In many cases meetings were arranged between them and in nearly every instance great improvement has been made.

In nine towns a feeling of antagonism existed. In five, this feeling has been straightened out and a spirit of cooperation now exists; in three, material improvement has been made, while in the remaining one steps are being taken which it is expected will improve the situation.

Examples of Cooperation

The central station men have, in most cases, been quick to recognize that a greater number of properly equipped and well operated electrical stores are essential to giving the very best service to the public and therefore to building up, to the greatest extent, the use of electric power company service. As a result several central stations have changed their policies with reference to the sale of appliances so that they are now selling on an ethical retail basis and under policies that encourage the dealers to be more active in developing the use of electrical service.

In one case a central station, after years of following a policy under which a dealer could scarcely conduct a retail business, has entirely withdrawn

from the field and is now cooperating with the contractor-dealer in the sale of appliances.

Arrangements have been made whereby twenty-eight contractor-dealers have been privileged to display appliances in the power companies' offices in their towns. In fourteen towns the lighting company is mailing out with its bills, advertising matter for the dealers. In one town the lighting company is working with the dealers in an appliance campaign employing several solicitors. In another town a saleswoman is employed by the dealers and central station to make sales for both. In another the lighting company made a big Christmas display in its office, selling the appliances for the dealers.

The encouragement given to the dealers by these and other similar acts of cooperation is, in no small part, responsible for the great improvement in their merchandising activities indicated in later sections of this report.

Assistance in Merchandising Given to the Contractor-Dealer

In the year's work the Field Representatives have covered the entire territory approximately three times in addition to several extra trips which were made into sections which needed special attention.

The greater portion of their time has been spent in assisting the dealers in improving their business methods. Twelve hundred and fifty calls have been made on 390 dealers. Assistance has been given them in the rearrangement and improvement of their stores, in window decorating, improved selling methods and other assistance as the individual case demanded.

Special effort was put forth in improving the feeling between the dealers themselves as well as between the dealers and the central stations. Numerous cases of unfriendly feeling and several cases of antagonism between dealers were found and the work has effected considerable improvement in the existing conditions.

As evidence of improved cooperation among contractor-dealers, 12 dealers are now engaged in two different house-to-house solicitor campaigns covering seven towns and adjacent territory. In addition to these solicitor campaigns 14 dealers are actively doing house-to-house soliciting.

The work with the dealers has resulted in a greatly increased interest in the retail business, and practically every store in the state shows some degree of improvement.

Dealers Equipped for Increased Appliance Sales

During the year 21 dealers have moved into better stores in better locations. Thirteen dealers have made major improvements in their stores involving extensive remodeling, while 23 have materially improved their stores by entirely rearranging them. Five dealers have rebuilt their show windows and 46 have shown marked improvement in trimming their windows. Twelve new retail stores have been opened during the year and there are six contractors who, although they have no stores, are actively pushing the sales of appliances. As a result of these various

improvements these dealers are now in a position to greatly increase their sales of appliances.

Some of the tangible results have been mentioned. Most of these improvements have occurred in the last few months and are the direct result of cumulative efforts put forth during the entire year. A further result of the year's work is that many more dealers are now contemplating various improvements in their stores and selling methods.

Other Accomplishments

The matter of a suitable trade mark for the California Association of Electrical Contractors and Dealers was brought up and discussed at nearly every meeting of the Advisory Committee last year. After a great deal of consideration, in which the committee had the assistance of men familiar with matters of this nature, they voted to lay the matter on the table as reports showed that the funds which would be necessary to make any trade mark of actual value to the association could be used to much better advantage along other lines of greater importance.

Regarding the matter of adequate and uniform system of accounting for the contractor-dealers, the committee has also been active. Arrangements were made to secure copies and complete information of the accounting systems that had been adopted by the National Contractors' Association, but when about to turn these over to the field men it was found that the National Association of Electrical Contractors and Dealers were revising the system. The revision has been completed and the field men will soon be in a position to present to the contractor-dealers the advantage of this system and the desirability for its universal adoption.

The committee is supplying to the contractors and dealers throughout the state suitable blanks on which they are expected to report the electrical appliances sold by them each month. The contractor-dealers are urged to mail these reports to the office of the committee regularly as soon after the first of the month as possible. A summary of all the reports (not giving the dealers' names) is to be made up and forwarded to the central stations covering the territory in which they operate. This will inform the generating companies in a concise manner of the activity of the dealers (collectively) and also of the number and kinds of appliances being placed on their lines.

Advertising

Until after the middle of the year the definite policy covering the advertising work of the campaign was not fully determined and put into operation. It now operates on the basis that the central stations offered to, and do, use a campaign business building advertisements in all or a portion of their regular newspaper space. For their use, copy is prepared of a conservative yet convincing nature and distributed simultaneously throughout the state. At the same time copies of the proposed advertisements are mailed to every contractor-dealer with a request that each one get in touch with the local representative of the central station in his locality and ascertain on what dates and in what publications the various advertisements will appear. They are

further requested to prepare corresponding but more specific advertisements of their own, and to have them appear on approximately the same dates as the more general advertisements of the central stations.

It is suggested that by previous arrangement with the newspapers the dealers' advertisements of specific appliances can appear on the same page as the central stations' copy, thereby increasing the "pulling power" of small inserts which by themselves might net meager returns. Another method is to have the central stations insert appear as an "opening gun" on the first of the week. The dealers' advertisements, giving prices and descriptions of appliances, then take the form of "follow ups" and appear in later editions during the week. With their windows trimmed to display the appliances advertised and their sales people alive to the week's special endeavor, the dealers usually experience a stimulation in the sale of the appliances thus cooperatively exploited.

Although the first of these organized advertising suggestions was not sent out until late in October, the results for November and December were very gratifying. Figures compiled from advertisement clippings in the Advisory Committee's office show that during these two months '11 central stations have used 1388 insertions of campaign copy. This work so stimulated the dealer's activity along these lines that during the same period 252 dealers in 117 different localities have used 1622 separate all-electrical newspaper advertisements.

The advertising work of the campaign has done much in the last few months to inspire the confidence of the contractor-dealers in the central stations' endeavor to make them more important factors in the distribution of electrical appliances. And in addition the direct sales by dealers resulting from their own advertisements have, in many instances, been sufficient to convince them that they should continue to profitably develop their business by this means.

Summary of Accomplishments

The first and foremost of the plans laid down by the Advisory Committee in its January, 1918 meeting was "the development of a closer cooperation and understanding between the central station employes and the contractor-dealers and their employes." Along these lines the Field Representatives, with the assistance of the Advisory Committee, have produced very gratifying results.

During the last year the central stations were shown more than ever before what could be done by the contractor-dealers in cooperative sales campaigns. In localities where this type of work was actively pursued by the dealers under the endorsement of the central stations very gratifying results followed in almost every instance. Through the Campaign activities the contractor-dealers found that the generating companies desire to cooperate and to assist the dealer to succeed. The contractor-dealers in turn, have responded enthusiastically and have improved their methods and equipment so that they are showing their cooperation with the central stations in many ways, but particularly by improved service to the general public.

No small part of the success of the campaign during 1918 was due to the fact that the Advisory Committee employed as field representatives two men of ability who were able to, and did, give personal individual attention to the problems of each individual contractor and dealer. The Campaign not only urged the use of better merchandising and better business methods, but the field men personally assisted each dealer or contractor to adapt the general suggestions to their own individual establishments. Much better results were therefore obtained than are secured by the general educational methods that are used in most association work.

Western Ideas

THE TEDIOUS JOB of preparing a vacation schedule for the salesmen was dispensed with last year by the jobbers of San Francisco by the adoption of a scheme which worked so well that they are thinking of repeating it this year. Instead of slowing up the work of the sales force all through the summer by having at least one, and sometimes more than one, absent all the time, all of the salesmen took their vacations at the same time—the first two weeks of July.

Although the full effects of the plan have not yet been analyzed, it proved so successful in many ways that it will be repeated, and it is also probable that most of the dealers will take their vacations at the same time.

One effect of the plan which was noticed was that during the last two weeks of June, which immediately preceded the vacation period, there was a marked increase in orders. This probably was due in a large measure to the fact that the jobbers sent out post cards to the trade advising them of the plan, and these cards acted as a stimulus and reminder to many of their customers. As the plan was followed by all of the local jobbers, all were on an equality and none gained at the expense of the others during the two weeks vacation period.

UNINTELLIGENT ORDERS sent by telegraph often cause annoying delays and are the cause of a much larger outlay of cost than is imagined. The following history of a telegram as sent by a division office of the Pacific telephone to headquarters is thus reported in the Pacific Telephone Magazine:

A telegram was recently received by the superintendent of supplies from a division office reading as follows:

"Please ship to — one No. 5 rubber pad, large or normal size."

This looks like a very simple order to the man who wanted the pad, and we desire to thank him for the opinion he has of our ability to fill such an order. We hope that the man who was responsible for that telegram will see this article, read it carefully, and in future make his requests so clear that we will avoid what happened in this particular instance, thereby saving expense and labor which can be put to better use.

The rubber pad was evidently required in a hurry, otherwise it would not have been ordered by telegraph, and we will follow the entire proceeding from the time it occurred until shipment was made:

1. Telegram dictated to the stenographer.
2. Stenographer wrote message on telegraph blank.
3. Stenographer called telegraph operator, gave the message and sent confirming telegram to supply department.
4. Telegraphed to San Francisco.
5. Telegraph operator called supply department.
6. Message taken by stenographer and typed.
7. Message handed to clerk for attention.
8. Clerk could not recall such an item and referred to supply catalogue to see if the item was specified.
9. Clerk passed telegram to superintendent of supplies with notation, "Can you say what is required?"
10. Superintendent of supplies gave it attention but could not recall such an item.
11. Supply department called service clerk, Western Electric Company, to know if Western Electric Company had ever furnished us on a requisition an item known as No. 5 rubber pad.
12. Service man, Western Electric Company, did not think so, but would inquire.
13. Western Electric Company called supply department advising that stock cards did not show the item.
14. Western Electric Company called supply department again, stating that perhaps the telegram was not correctly transcribed and that an installer's mat was required. Supply department stated that installers' mats were not designated by numbers and also that they were made of canvas.
15. Western Electric Company called supply department again to say that perhaps corrugated rubber matting was wanted to be used in front of the power board. Supply department stated that rubber matting was not designated by that number and had not heard that rubber matting was furnished in large or normal sizes.
16. Supply department called engineering department to ascertain if it knew what a No. 5 rubber pad was and for what purpose used.
17. Engineering department called supply department and stated it was not used in outside construction and suggested that it be referred to the equipment engineer.
18. Supply department called equipment engineer, asking the same question, and was told that he had no knowledge of the item but it was possible that the telegram referred to a rubber hot-water bottle and that it might be required for use in the operators' retiring room or sick room.
19. Supply department called traffic department to ascertain if it had any knowledge of a No. 5 rubber pad for use in the operators' retiring room, and was advised that the telegram probably meant hot-water bottle. The foregoing efforts to get the answer proved of no avail, and it was necessary to go to the source for information.
20. Supply department dictated a telegram reading as follows: "Your message yesterday, one No. 5 rubber pad. We can not intelligently place the order. What is a No. 5 rubber pad, and for what purpose used?"
21. Stenographer wrote out telegram.
22. Stenographer called telegraph department and transmitted message.
23. Telegraph operator forwarded to destination.
24. Telegraph operator called the division office and read the message over the phone.
25. Stenographer received message and typed same.
26. Message passed through several hands and finally reached the sender.
27. Sender dictated a reply as follows: "Your telegram July 12th. What we desire is one No. 5 rubber pad listed on page 15 Pulmotor catalogue, Vol. 5, code 'Wallbrike.' It is used in the face mask in connection with the pulmotor."
28. Message telegraphed to San Francisco.
29. Telegraph operator called supply department and gave message to stenographer.
30. Stenographer typed and handed the message to clerk.
31. Clerk called Western Electric Company and placed the order for immediate shipment, and it went forward the same day.

Of course, the superintendent of supplies should have known when the first telegram was received, just what to order,—there is no question about that whatever,—but he did not. There are rubber pedal pads for automobiles; rubber heel pads for automobiles; rubber pads for use with time stamps, and many other pads used for different purposes, and had any one of them been purchased and shipped, it would have been returned because it was not what was required.

It can readily be seen that the vital word necessary to order the item was omitted from the first telegram, and had the words "for pulmotor" appeared all this labor and expense would have been avoided. The telegram should have read: "One No. 5 rubber pad for pulmotor, large or normal size."

A computation of what this transaction cost in time and expense to all concerned will prevent any business man from sending over his name a carelessly worded telegram.

DIRECTORY OF THE NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

(A list of the officers and members of the chief committees of the National Association of Electrical Contractors and Dealers which will prove handy for reference.—The Editor.)

OFFICERS

National Chairman, W. Creighton Peet, 70 E. 45th St., New York City
General Manager, W. H. Morton, 110 West 40th St., New York City
National Treasurer, E. McCleary, 423 Stevens Building, Detroit, Mich.
National Secretary, A. G. Harrington, 110 West 40th St., New York City

EXECUTIVE COMMITTEE

Atlantic Division

W. Creighton Peet, Chairman, 70 E. 45th St., New York City
W. K. Tuohey, 332 Dwight Street, Springfield, Mass.
M. E. Arnold, 114 No. Eleventh Street, Philadelphia, Pa.
G. M. Chapman, 43 East Main Street, Waterbury, Conn.
T. H. McKinney, Peters Building, Atlanta, Ga.
P. H. Jaehnig, 109 Bank Street, Newark, N. J.

Central Division

G. M. Sanborn, Chairman, 309 N. Illinois St., Indianapolis, Ind.
J. A. Fowler, 10 So. Second Street, Memphis, Tenn.
J. E. Sweeney, 25 Bridge Street, Waterloo, Iowa
J. N. Pierce, 215 No. Randolph Street, Chicago, Ill.
Robley S. Stearnes, 335 Camp Street, New Orleans, La.
W. I. Gray, 914 Mary Place, Minneapolis, Minn.

Pacific Division

J. F. NePage, Armour Building, Seattle, Wash.
Sam Jagger, 111 W. Park Street, Portland, Ore.

Executive Committeemen at Large

M. G. Buchan, 2114 E. Second Street, Cleveland, Ohio
Fred B. Adam, 914 Pine Street, St. Louis, Mo.
W. D. Kohlwey, 237 Powell Street, San Francisco, Cal.

COMMITTEE CHAIRMEN

Industrial Development, W. Creighton Peet, New York City
Universal Data and Sales Book, J. A. Fowler, Memphis, Tenn.
Code, W. Creighton Peet, New York City
Membership, M. E. Arnold, Philadelphia, Pa.
Legislation, W. D. Kohlwey, San Francisco, Cal.
Labor, J. N. Pierce, Chicago, Ill.
Publication, Paul H. Jaehnig, Newark, N. J.
Liability Insurance, J. A. Fowler, Memphis, Tenn.
Conventions and Meetings, M. G. Buchan, Cleveland, Ohio
Credit and Accounting, J. E. Sweeney, Waterloo, Iowa
Credentials, Geo. M. Chapman, Waterbury, Conn.
Housewiring, T. H. McKinney, Atlanta, Ga.
Merchandising, Fred B. Adam, St. Louis, Mo.
Jobbers, W. K. Tuohey, Springfield, Mass.
Manufacturers, G. M. Sanborn, Indianapolis, Ind.
Central Stations, Robley S. Stearnes, New Orleans, La.
Architects, Sam Jagger, Portland, Ore.
Engineers, J. F. NePage, Seattle, Wash.
Standardization, W. I. Gray, Minneapolis, Minn.
Statistics, Fred B. Adam, St. Louis, Mo.
U. S. Chamber of Commerce, W. Creighton Peet, New York City

STATE CHAIRMEN AND SECRETARIES

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J. R. Wilcox, Birmingham		T. G. Erwin, Gadsden
J. R. Bloom, Pine Bluff	Arkansas	J. C. Dice, Little Rock
M. A. De Lew, San Francisco	California	J. Redpath, San Francisco
E. S. Francis, Hartford	Connecticut	Geo. M. Chapman, Waterbury
T. H. McKinney, Atlanta	Georgia	Dan Carey, Atlanta
R. M. Sutton, Wichita	Kansas	H. S. Lee, Topeka
J. A. Weishar, Rock Island	Illinois	L. B. Van Nuys, Peoria
Executive Secretary, G. A. Engelken,	Indiana	55 W. Harrison St., Chicago
A. L. Swanson, Evansville		Geo. S. Skillman, Indianapolis
J. E. Sweeney, Waterloo	Iowa	F. Bernick, Jr., Oskaloosa
C. S. Barnes, New Orleans	Louisiana	Gabe Correjoles, New Orleans
S. C. Blumenthal, Baltimore	Maryland	John S. Dobler, Baltimore
A. J. Hixon, Boston	Massachusetts	J. E. Wilson, Boston
L. R. Greusel, Battle Creek	Michigan	Bruce W. Palmer, Detroit
W. I. Gray, Minneapolis	Minnesota	C. A. Craft, Minneapolis
Fred B. Adam, St. Louis	Missouri	W. F. Gerstner, St. Louis
C. R. Newman, Passaic	New Jersey	
J. J. O'Leary, Buffalo	New York	P. J. Ryan, New York City
F. C. Werk, Cleveland	Ohio	M. G. Buchan, Cleveland
	Oklahoma	W. W. McMichaels, Tulsa
J. R. Tomlinson, Portland	Oregon	J. W. Oberender, Portland
A. Gentel, Philadelphia	Pennsylvania	M. G. Sellers, Philadelphia
P. W. Curtis, Chattanooga	Tennessee	J. A. Fowler, Memphis
R. J. Nickles, Madison	Wisconsin	J. A. Piepkorn, Milwaukee

CUSTOMERS' COMMENTS

(Contrary to general impression, perhaps, these articles are not written by members of the Journal staff. The following comments are the result of a shopping expedition undertaken in the last few days by a teacher in one of the smaller California cities. The situation she points out is not connected with the holiday rush, but is one of the everyday problems connected with the electrical dealer.—The Editor.)

Having just returned, somewhat disappointed, from an unsuccessful attempt to purchase an electric toaster and an electric heating-pad, I write this article to the Journal of Electricity, hoping that it may be published by the Journal and that it may be read by the proprietors of the electrical shops at which I have had my experiences. I hope they will take in good part the adverse criticism and will make the necessary changes, because the management in all these shops of which I am writing is in the main so good that a slight improvement is all that is necessary to make things easier for the buyer.

Insufficient Service —

In the first shop, insufficient service was the cause of dissatisfaction to the patrons. Six of us were waiting for attention. The one clerk was so



The window around which the crowd gathers is also one which converts the window gazer into an actual purchaser—that is, provided the interior of the shop lives up to its advertisement.

courteous and so clever in the division of his time that he kept us all amiable, and I am sure that all appreciated his efficiency, but nevertheless four went away without purchasing. One was evidently a prosperous business man, who knew the kind of lamp he wanted and had ready money for the best, but had no time to wait his turn as a purchaser. Another was a boy, too eager for a flashlight to wait calmly even a minute. He pushed his way between a patient, elderly lady and the counter, and then, unable to secure the attention of the one clerk, again shoved the lady aside, and without the longed-for flashlight rushed out, probably to try his luck elsewhere. A third, a man somewhat decrepit and noticeably weary, stood some minutes holding a heating pad that was evidently what he needed and with which he was as evidently pleased, but two young girls were monopolizing the attention of the one handsome young clerk, so the old man laid down the pad and, with a sigh, followed the business man and

the vigorous boy. I then decided to seek toasters elsewhere, although the clerk had managed to bring for my inspection one that seemed more satisfactory than any I had seen before. Whether the pretty girls made purchases of sufficient value to compensate for the sales lost, no one except the clerk who had made every possible effort to serve all, will probably know. It is true that the thoughtless girls were the cause of some delay, but the proprietor will, I think, increase his profits by securing the services of an additional clerk or two.

I can almost hear the proprietor's reply, his account of difficulties in securing capable clerks. Fortunately those difficulties are daily becoming fewer. Men will be ready for the positions, and all young women are not thoughtless, indeed the greater number are proving their value. For service in electrical stores, as elsewhere, they can render efficient service.

A Crowded Window —

My criticism of the second store that I passed in my quest for toaster and pad (I say "passed" because I did not enter) is in regard to the display in the window. I think this window presented a sample of every kind of article the store contained. A great variety surely, but so crowded, so poorly arranged that nothing looked worth buying. The window suggested a junk shop rather than one of the best electrical stores, which, I have been informed, I failed to appreciate.

Poor Lighting —

Next I came to a store with a more inviting exterior, but upon entering I immediately became depressed. Coming from the bright and cheery sunshine, I found the dim lighting of the interior was a discouraging contrast. Here the inside dimness had an effect similar to the effect of the crowded window. Nothing looked worth examining. Yet here, dark as it was, there were too many buyers for one clerk, so I had the services of an employe called from the work room. Being without a coat he seemed a little embarrassed, but he knew how to display wares to the best advantage and almost persuaded me to buy an article that really did not meet my entire approval. He would have succeeded, I am sure, had not the dim light made me doubtful of everything there.

Where Customers Congregate —

A few blocks farther on, I was attracted by a window surrounded by an admiring crowd. Some admired and passed on, enthusiastically praising as they went. Others went silently on their way, showing keen pleasure however in expression of face and lightness of step. And many went into the shop. Gradually I moved toward the window and when near enough to see the display, I was as pleased as the others. Lamps were there of various kinds, but lamps only, yet greater beauty is rarely presented. Each lamp was so placed that its essential and characteristic value could be clearly seen, and the grouping gave the effect of the enchanted palace that met Psyche's gaze in the magic grove. I gazed with wonder; then followed those who had entered the

store, not because I wanted a lamp, but because this window suggested the perfection of everything within. And truly everything was the kind one wishes to buy, but although the desired articles were there, and buyers eager to secure them, many sales were lost because two clerks could not serve all, and for this reason both store and purchasers suffered.

ADVERTISING ADVERTISEMENTS

BY IRA R. ALEXANDER

(How one of the big department stores set people to reading of their wares by advertising their advertisements, as told in a recent issue of Advertising and Selling. Some of the suggestions here made are applicable to local contractor-dealer advertising campaigns—and are here offered as food for thought.—The Editor.)

Recently the writer visited a friend in a certain Colorado city who is the advertising manager of a large department store, and during the course of our conversation the subject of advertising was touched upon. My friend, whom we shall call Thomas, had ideas of his own relative to advertising, and told of a novel plan he was making use of in giving his firm a worth-while publicity.

"In my advertising I had advertised everything in the store, and finally I began looking around for something new, something a little out of the beaten path," stated Thomas in talking of his work, "and I decided it would be a pretty good plan to advertise our advertisements. I first tried out the method some six months ago and I have made use of it off and on ever since with big results."

At that point I became interested and asked a number of questions, the answering of which brought replies that I am sure will be of interest to other men engaged in giving any line of business publicity. With that idea in view a number of the methods carried out successfully by Thomas are set forth in this article.

"The first thing I did," continued Thomas, "after the idea took hold of me was to get the firm to give me a window and I proceeded to get up a window display of my own—it was an advertisement window.

Posting the Public

"On a large piece of white cardboard I pasted twenty of our advertisements that had appeared in the local newspapers during the past few weeks. On another card I had information that if the people would watch the local newspapers during the next few days they would find out what it was all about.

"On the second day after the ads appeared in the window I devoted our entire advertising space in all the local newspapers to telling the people that the person who wrote the best essay on which was the best advertisement displayed in our window and why, would receive a \$20 gold piece. Second and third prizes were also offered.

"The contest ran for ten days, and in our ads all during that period attention was called to our

window, and the reason for it explained. Each day large numbers of people gathered in front of the window and the different ads were studied; and that fact alone gave our store and our advertising a lot of worth-while publicity. We received a large number of essays and a good many of them gave us valuable advice that aided in writing future ads and let us know just what the people thought of them. It put us in a position to write better advertisements, and write them more from the people's viewpoint, and in that way we produced ads that attracted more attention. The contest also got the people in the habit of watching our advertisements and they studied them from day to day as they appeared in the papers.

Another Contest

"Two months ago I conducted another contest along similar lines. I let the people know through our advertisements that the person writing the best essay on which of our ads that appeared in the papers during a month's time they considered the best and why would receive a prize. This contest also attracted a lot of notice and secured for us worth-while results, as the people turned to our ad in each issue of the paper and many of them cut them out as they appeared in order to have a complete file from which to write their essays. This, of course, caused the ads to be read thoroughly and many read them that would not have done so had they been run in the ordinary way.

"During the time the contest was in progress an increase in all departments was noted which was credited to the contest.

"At present we are carrying on another little plan which is already meeting with results. We are letting people do a little ad writing of their own. We have a display window down stairs filled with a large assortment of small articles we have on sale here and the people are to study that window and write an advertisement featuring any ten articles in that window that they care to and the person that writes the best ad, and the ads will be judged by disinterested parties, will be given a prize in the shape of \$25 in money. We have also made known that the ten best ads will be run in the newspapers in place of our regular ads and the authors' names will be given.

"People come to our window and study the articles therein in order to get material for their advertisements and in looking at the window display many see articles that they are in need of and thus reminded they come into our store and so we have increased our business as a direct result of our contest. We are also paving the way to future business by it.

"There are many ways of advertising advertisements and it is well worth while for a man that is looking for something a little out-of-the-ordinary to follow up. I have found that my ads have a much bigger drawing power since I conceived the idea of giving them publicity."

PORTLAND SIGN ORDINANCE

(Some of the details of new sections of the recent sign ordinance adopted in Portland, Oregon, are here given. They will be of interest to sign men and contractors throughout the West for purposes of comparison with the local regulations under which they work.—The Editor.)

Permits and Fees

It shall be unlawful to maintain, erect, install, repair or reerect any sign in the City of Portland without complying with the provisions of this ordinance relating to signs, and no sign shall be maintained, erected, installed, repaired or reerected in the City of Portland without first securing a permit therefor as provided in this section.

Any person desiring to obtain a sign permit shall file a written application therefor with the Bureau of Buildings, which application shall contain information showing the type of construction, supports, design and location of the sign to be maintained, erected, installed, repaired or reerected, and if it shall appear from such application that such sign will comply with the provisions of this ordinance relating to signs then the Inspector of Buildings shall issue a permit therefor. In case any such sign shall require electric wiring such applicant shall secure an electrical permit and all wiring done under such permit shall in all respects comply with the provisions of Ordinance No. 31793 as amended relating thereto and shall be subject to inspection by the Chief Electrical Inspector.

No sign extending beyond the curb line or suspended over the street between curb lines shall be erected or maintained in the City of Portland without a special permit from the Council.

The fee to be paid for each sign permit shall be fifty (50c) cents.

Construction of Signs

(A) Signs erected in the fire limits, as they are now or may hereafter be extended, shall be constructed entirely of metal not lighter than No. 28 U. S. steel gauge or other non-combustible material. The frame shall be of angles or other steel shapes or galvanized iron not less than 20 U. S. steel gauge and the edges of the sheet metal shall be clinched or riveted and soldered together. In all other respects signs must comply with the requirements of the Building and Electrical Codes in regard to mechanical strength of the various parts and construction methods.

The following limitations are placed upon the use of glass in signs.

Glass in which wire mesh is embedded shall not exceed seven hundred twenty (720) square inches in area or forty-eight (48) inches in any dimension for any piece.

Glass in which wire mesh is not embedded shall not be less than one-quarter ($\frac{1}{4}$) inch in thickness and shall not exceed fifty (50) inches in area for any piece except that letters or numerals made of glass, having surface covered by metal, except the letter or numeral, will be permitted, provided the glass is not more than one hundred forty-four (144) square inches in area for any piece.

Support of Signs

(B) All signs shall be supported from the building with proper metal supports, which, when attached to masonry wall, shall be attached by expansion bolts or shall be built into the masonry or shall be fastened in masonry by anchor bolts set in cement or sulphur or by bolts running through the wall, and shall be laterally secured with guy wires adjustable by means of turnbuckle.

Location of Signs

No horizontal sign shall be erected in such location that the same will, when viewed sixty (60) feet away with the eye of the observer five feet above the sidewalk, blanket another sign eighty (80) feet away of the same dimension

and the same distance above the sidewalk. A border not exceeding three (3) inches in width may be blanketed without coming within the scope of this ordinance.

The following table of distances for horizontal signs above the sidewalk and the height of signs shall govern all signs covered by this ordinance.

TABLE

Distance of Lower line of horizontal signs above the sidewalk:	Maximum height of horizontal signs:
10 feet	24 inches
11 "	27 "
12 "	30 "
13 "	33 "
14 "	36 "
15 "	40 "
16 "	44 "
17 "	48 "
18 "	52 "
20 "	54 "
20 "	54 "

No vertical sign shall project beyond the property line more than six feet. The lower line of any vertical sign above the sidewalk shall be not less than fifteen (15) feet.

No horizontal sign shall be erected within twenty (20) feet of another similar sign, measuring from center to center of such sign, when any portion of such horizontal sign is in the same horizontal plane as an adjacent horizontal sign.

Any sign which extends to within twelve (12) inches of the curb shall be at least twelve (12) feet above the sidewalk. Signs which project more than four (4) feet six (6) inches beyond the property line shall be limited in height to four (4) feet six (6) inches unless the lower line of the sign is twenty (20) feet above the sidewalk, in which case the projection shall not exceed ten (10) feet and the projection shall not exceed six (6) feet if the height of the sign is more than ten (10) feet.

All signs shall be so constructed, located and maintained that they will not obstruct the ingress to or egress from windows or fire escapes.

Illumination of Signs

All signs shall be illuminated from dusk to 11:30 p.m. in the inner fire limits, and from dusk until 10:00 p.m. outside the inner fire limits, each day including Sundays.

Electrical illumination shall be provided on both sides of all signs within the inner fire limits amounting to not less than eight (8) candle power or one hundred (100) lumens for each square foot of sign surface, unless within ten feet of a marquise, when one side only may be illuminated, provided illumination on such side is increased by fifty (50) per cent. This illumination must be in the form of incandescent lamps or globes on the surface of the sign to the extent of not less than seventy-five (75) per cent of the minimum candle power required. The balance of the minimum candle power to be installed may be furnished by incandescent lamps in the interior of the sign which afford light by means of prisms, lenses or transparencies.

All letters or characters greater than thirteen (13) inches in height must be outlined by exposed incandescent lamps and at least four lamps must be used in the vertical stroke of each capital letter. Letters from twelve (12) inches in height to seven (7) inches in height must be illuminated by outlining with exposed lamps or by means of prisms, lenses or transparencies. Letters of six (6) inches or less in height may be illuminated.

Illumination shall be provided on both sides of signs outside the inner fire limits amounting to three (3) candle power or thirty-seven (37) lumens per square foot of sign surface. This illumination may be provided either by incandescent lamps on the exterior surface of the sign or in the interior of the sign. For lamps located in the interior, proper lenses, prisms or transparencies shall be provided.

The candle power of lamps used for lighting signs shall be the spherical candle power rating. In cases of lenses,

prisms and transparencies, the assumption shall be that fifty (50) per cent of the candle power of the lamp is lost in passing through the glass, and the candle power of the lamps placed inside the sign for such purposes must therefore be increased to allow for such absorption.

Swinging of Signs

All signs, except marqueses as covered in Section 12e, shall be arranged to swing against the building so that the fact of the sign is parallel to the front of the building and when so swung shall not interfere with access to or egress from a fire escape.

Design of Signs

No permit shall be issued for any sign which represents any article or thing which is of a non-artistic nature, or which in itself is unsightly, grotesque, of offensive character or a monstrosity, it being the intent and purpose of this ordinance that all signs constructed over sidewalks shall be attractive in appearance. Any person who feels aggrieved by the refusal of the Inspector of Buildings to issue a permit as herein provided may appeal to the Council for relief from the action of said Inspector.

Use of Marquise for Signs

Nothing in this ordinance shall prevent the use of a marquise for signs. A sign may be placed on a marquise, provided the sign, or face of the marquise, including sign, does not exceed three (3) feet in height and the sign advertises only the name of the building, the name of the owner, lessee or tenant of such building, or the nature of the business, except in the case of a theater or motion picture house when the height of a sign may be not to exceed four (4) feet six (6) inches and may advertise the attraction of the show house. Such theater or motion picture house sign need not be illuminated. Except as herein provided no marquise shall be used for general advertising purposes, nor shall signs other than electrical signs be hung or attached to any marquise.

Maintenance of Signs

All signs shall be kept in perfect structural condition at all times and shall be subject to inspection by the Bureau of Buildings of the City of Portland; Provided, however, that said City shall in no case be liable for damage caused by the neglect or failure to keep signs in safe condition, but the owner of any sign shall be responsible for all damage caused by the defective condition of such sign, and every person maintaining a sign in the City of Portland shall, upon removal from the premises adjacent to which such sign is maintained, forthwith remove such sign. If it should appear that any sign is becoming unsafe, dirty, dingy or unattractive the Inspector of Buildings shall notify the owner of such sign to put same in a safe condition or to paint or clean the same whenever the occasion shall demand. Any failure or neglect to fully comply with the provisions of this ordinance relating to signs shall be the cause for the revocation of any sign permit granted hereunder.

ANNOUNCING VISITORS ELECTRICALLY

The Telautograph, an electrical device for automatically transmitting messages in writing, is now in operation in the lobby of the Emergency Fleet Corporation's building, and promises to be not only a great time-saver for officials, but a means of preventing strangers, without proper credentials, from wandering into the office floors of the building. The master machine, consisting of a sending, and three receiving machines, is located on the first floor, at the information counter, with connections on each side of the floors above, from which messages may be received or sent. Under this system, when a visitor

comes into the building to see an official or employe, he will state his name and business to the operator in the lobby.

Handwriting Reproduced

She will write it on the machine, and at the same time machines on upper floors will reproduce the messages in her handwriting. The second message will be delivered to the person to whom it is addressed, and he will send his reply. If he wishes to see the caller, that fact will be communicated by the machine on his floor to the one on the first floor. The return message is to be stamped by the operator

*Sample of work
done on the
Telautograph
12 3 4 5 6 7 8 9 0*

and will constitute a pass permitting a visitor to enter the elevator.

This is but one use to which the machine can be put. Messages can be written by a person on the first floor and transmitted, in the original handwriting, to persons on any or all of the upper floors.

The writing on the receiving machines is done by an electrically-controlled pencil, which is caused to move on the paper by a variation of electrical current, resulting from movements of the metal pencil on the platen of the master machine.

Connections Easily Made

Connections with the various floors, either individually or in groups, are established by ringing keys similar to those on the telephone switch board.

Thus, the device works very much like a voltmeter, where the needle indicator changes position according to the amount of electrical load passing through. A sample of the work of the Telautograph, which was taken from a machine on the sixth floor, after having been transmitted from the first floor, is reproduced herewith.

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule VIII. The contractor shall not be required to cut any work, except his own, and shall not be required to cut, alter or move his own work if due to any cause for which he is not responsible.

THE DIESEL ENGINE ON SHIPBOARD

BY BRUCE LLOYD

(The possible supremacy on the sea which is now open to America is largely dependent on the adoption of the most economical method of transportation available. The success of the Diesel engine as it has actually been tried out on vessels built on the Pacific Coast and the reasons for its slow acceptance are here frankly discussed by the Marine Engineer for the Concrete Section of the Emergency Fleet Corporation. The paper is one of a number which made up a most valuable program at a recent meeting of the San Francisco section of the A. S. M. E.—The Editor.)

The Success of the Steam Engine

In dealing with this subject, which is so diversified in character, it seems almost impossible to begin without paying a tribute to the machine which the ship owner is now asked to discard for the internal combustion engine.

The development of the steam engine, extending over a period of about one hundred years, has reached such a stage that it is probably today the

that it has been received with favor; nor have its attendant dangers and other well known disadvantages been removed, on which account its disappearance is devoutly hoped for by many.

The space occupied by the boiler of a steamship, together with the large amount of room necessary for fuel, is the most obvious and perplexing feature that presents itself to the ship owner who contemplates the construction of a serviceable and economical cargo carrier. Attempts have been made to overcome this objectionable feature by placing the boilers on the upper deck of the ship, which is not so valuable for cargo space, but the fact remains that the boilers are still on board, adding at least their weight, and detracting just so much from the general efficiency of the vessel.

Reasons for Delaying Acceptance of the Diesel Engine

In spite of the fact that the internal combustion engine has overcome this difficulty and given him a tremendous advantage in cargo carrying capacity, the average ship owner has clung to the steam driven vessel with a tenacity equal to that shown by his forefathers in their disinclination to discard the sailing ship and adopt the steamer, and it may be noted here that so strong was this distrust of the steam engine that it is only within the last fifteen years that owners of steam ships were able to overcome their fears that the steam engine might conceivably break down and dependence have to be placed on sails, all ships up to that time being provided with considerable sail area. The history of the application of the steam engine to the propulsion of ships thus shows an exact parallel to the introduction at the present time of the internal combustion engine for the same purpose, auxiliary sail power being still much in evidence in motor ships.

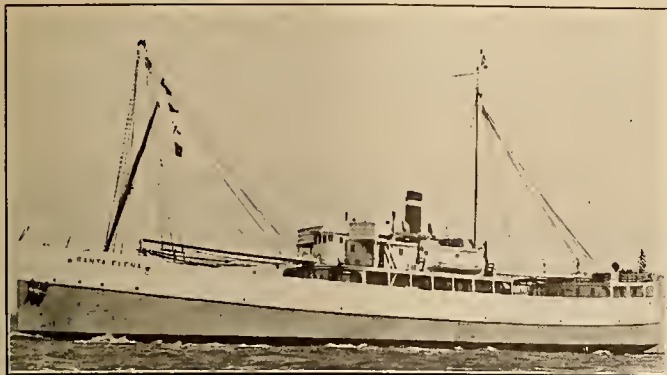
There are, however, besides his abiding faith in the steam engine and his distrust of the internal combustion engine, other and perhaps more weighty reasons which prevent the ship owner from adopting the latter more readily. Until very recently the ports of the world were regulated and equipped to suit the conditions of steamship traffic. Almost every port in the world, no matter how remote from the great centers of shipping, was provided with some facilities for repairing the boilers and engines of the ordinary steamship; neither did they lack the mechanics who possessed the necessary skill to make these repairs and engineers well versed in the operation of a steam engine were always available. Thus, the shipowner when arranging for a voyage to a distant port, secure in his knowledge of the above facts, felt no concern as he knew his vessel would



The motor ship "Nuanu" which has just made her maiden voyage to the Philippines for the Vegetable Oil Company. She is provided with a 320 h.p. Bolinder engine.

most perfect machine that has ever been produced; its reliability is unquestioned, its economy is high, and it has become so familiar as a prime mover that there is now very little difficulty in procuring operators to handle it successfully. The steam engine is wonderfully smooth running and possesses great flexibility of power, and it is not too much to say that it has now reached the zenith of its perfection.

Unfortunately, however, the steam engine is not complete in itself and its future is doomed by its necessary adjunct, the steam generator, which has never been improved to such a degree of economy



The motor ship shown on the left is the "Santa Elena" which is one of four similar cargo boats built for W. R. Grace & Company of San Francisco and New York, outfitted with twin 320 b.h.p. engines and capable of $8\frac{1}{2}$ knots speed. This vessel completed a voyage from San Francisco to



Payta, S. A., direct in 19 days with about 2000 tons cargo. The vessel on the right is the "City of Portland," a so-called Auxiliary ship equipped with two 320 b.h.p. engines designed for carrying lumber to the east. She has already made two trips to Australia at an average speed of 6.8 knots.

DIESEL ENGINES IN PRACTICE

be well taken care of. Up to the present time, however, equal facilities have not been provided for ships whose motive power is the fuel oil engine, although this fault is gradually being overcome.

Another thing which served to retard the development of the fuel oil engine was the fact that European shipowners who controlled the bulk of the world's shipping, were, with the exception of those in Scandinavian countries, to some extent interested

The war has, of course, considerably delayed the more general adoption of the fuel oil engine owing to the imperative demand that has arisen for ships driven by machinery to which the shipping world is entirely accustomed and for which there was a plentiful supply of skilled operators.

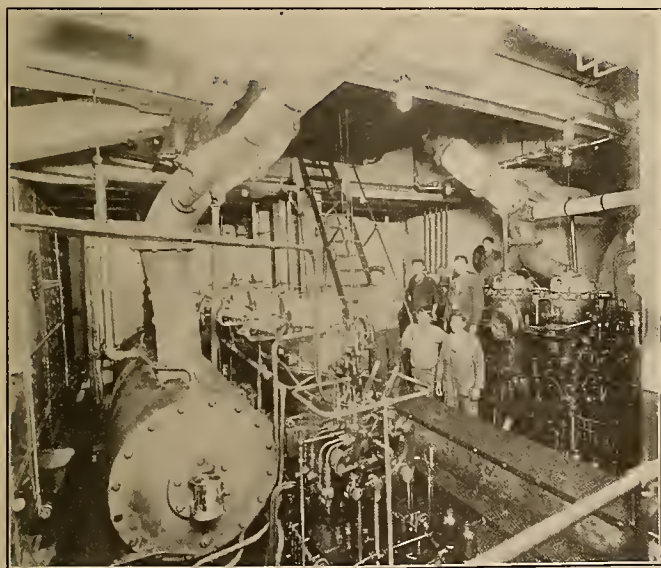
The Reliability of the Internal Combustion Engine

The foregoing, I believe, are the principal reasons for the antagonistic attitude of shipowners toward the fuel oil engine, which attitude is now rapidly being overcome. The reliability of the internal combustion engine is now proved absolutely beyond question when the engine selected is of well known design and constructed by a builder of long experience and established reputation—the installation carefully made in a well constructed hull, with a proper appreciation of the class of cargo that is to be carried. The owner who is swayed by a desire for cheapness either in the purchase of the engine or the installation on the ship will get just what he paid for and the general reputation of the engine will have suffered accordingly.

The experience of the writer has been almost entirely with the Bolinder Crude Oil Engine, manufactured by the firm of Messrs. J. & C. Bolinders, Sweden. This engine is of the direct reversible type and has been especially designed for full powered sea-going vessels. There are no cam shafts or intricate gearing; all pumps, etc., being driven off eccentric on the crank shaft; a small compressor driven off the forward end of the crank shaft supplies air for pulverizing the fuel on entering the cylinder; the reversal of the engine's direction of rotation is affected by pre-ignition, maneuvering in a method similar to that of the steam engine. These engines are manufactured in 2 and 4 cylinder sizes up to 1000 b.h.p.

The Diesel Engine in Use

During the past two and one-half years sixteen vessels owned and operated on the Pacific Coast have been equipped with these engines for motive power, ten of these being what is termed Auxiliary ships, in which the sail power is intended to predominate. All of them are engaged in overseas trade to distant ports, where fuel is either not available or procurable only at almost prohibitive rates. Fuel tankage had therefore to be provided of sufficient capacity



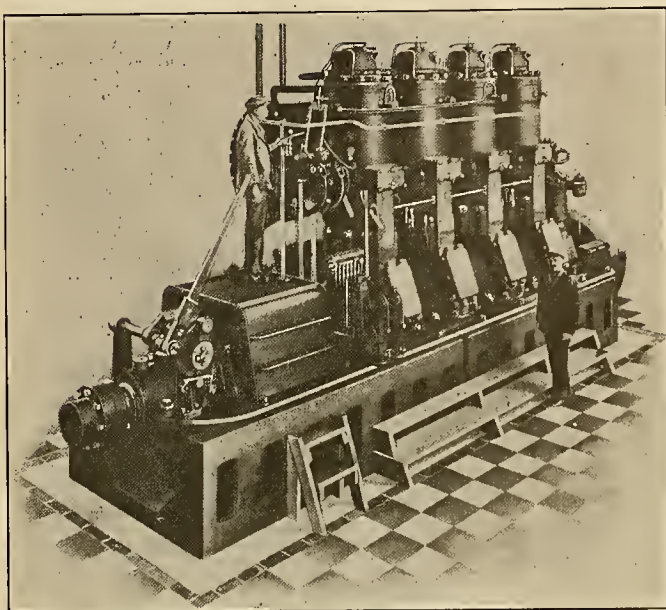
The boiler room of the "Sierra," showing the Diesel engines installed. The great saving is in the doing away with the cumbersome boiler.

in the coal industry and they were also afraid that, should they become dependent on oil for fuel, the price would considerably advance and the supply prove inadequate.

The attitude of the shipowner toward the internal combustion engine has also been influenced to some degree by his advisers, the naval architect and superintending engineer, many of whom have not taken up the study of this particular branch of engineering and who even look askance at it. These men would naturally hesitate to advise the equipment of a ship with machinery which is unfamiliar to them; nor would they be willing to assume the responsibility of superintending the installation of this machinery—afraid of encountering the difficulties which they might personally be unable to overcome.

to supply the engines, when running at full speed, for a voyage outward and homeward of nearly 17,000 miles. These ships vary in size from 1500 to 3500 dead weight tons, and the size of the engines with which they are equipped, from 320 to 600 b.h.p. The machinery of these motor ships has been in continuous service now for nearly two years, operating for periods from 35 to 50 days without once stopping the engine, with the exception of minor mishaps which have occurred only in the first two installations.

Space will not permit reference to the performance of more than one ship of each type.



A 500 b.h.p. Bolinder engine on the testing bed

The first large Auxiliary ship, equipped with "Bolinder" engines on the Pacific Coast, was the motor ship "City of Portland," one of the three sister ships built and owned by the McCormick Steamship Company of San Francisco. These vessels are approximately 3500 deadweight tons and are able to carry more than 2,000,000 feet of lumber. They are equipped with twin engines of 320 b.h.p. each and have as auxiliary machinery for electric light purposes two 8 b.h.p. stationary engines of the same manufacture as the main engines, directly connected to 5 kw. generators. The "City of Portland" has made two voyages to Australia, carrying lumber on the outward voyage and returning with large cargoes of copra collected at different islands in the Pacific. She has made voyages to the eastern coast of the United States, via the Panama Canal, and has now just completed a voyage from Astoria to Shanghai which occupied 34 days. The engines have run continuously, often making runs of 45 days without any stoppage of the machinery. The average speed maintained to Australia was 6.8 knots. During the voyage to Portland, Maine, from San Francisco, and to Shanghai from Astoria, the engines were allowed to develop their full power, and the speed averaged 7.5 knots per hour. The sails were of practically no use on any of these voyages, and these vessels should be properly designated as low powered motor ships.

The fuel consumption averaged twenty-three barrels per day of oil of 24 degrees Baume gravity and the total amount of fuel oil used for propelling the ship on the round voyage covering 17,000 miles, 1997 barrels.

The motorships that have attracted the greatest attention are the full powered vessels, as they afford the best opportunity of comparison with steamships, and of these the four that have lately been added to the fleet of Messrs. W. R. Grace & Co. are excellent examples of the possibilities of modern sized ships equipped with fuel oil engines. These ships are the "Santa Elena," "Santa Isabel," "Santa Cristina" and "Santa Flavia," and their dimensions are as follows: Length 205 feet, breadth 42 feet, depth 29 feet, cargo capacity about 2,000 tons on 18 ft. 6 in. draft. The propelling machinery of each ship consists of two 320 b.h.p. "Bolinder" engines (twin screw). The main fuel supply is carried in steel tanks, having a total capacity of 1770 barrels, sufficient for nearly 75 days running, and the extensive radius over which they are able to travel without having to stop for refueling gives them an immense advantage over the ordinary steamer, to which may be added the cargo space obtained by the elimination of the boiler space. All of these vessels have completed voyages to New York via Valparaiso, calling at other South American ports and the Panama Canal, covering a distance of over 14,000 miles, at an average speed of 180 knots per day. There were no detentions at sea, and none at any port on account of repairs to engines.

Load displacement of the above motorships is approximately.....	3850 tons
Weight of hull and equipment.....	1700 "
Weight of machinery	64 "
Weight of fuel oil necessary for voyage of 70 days.....	240 "
Water	12 "
Stores	8 "
Cargo capacity	1826 "

Load displacement of steamships with reciprocating engines of approximately	3850 tons
Weight of hull and equipment.....	1700 "
Weight of machinery	150 "
Fuel oil for 70 days' steaming.....	630 "
Water	60 "
Stores	8 "
Cargo capacity	1802 "

Meeting Difficulties in Operation

Of the problems that appeared at first, the most disturbing was the lack of skilled operators, but in a surprisingly short time it was found that the local engineers were able to thoroughly understand and operate this type of engine, and there is now very little difficulty in obtaining engineers, who although previously with the marine steam engine, are now competent to undertake long voyages in motorships, which has been fully proved by the records of voyages mentioned.

The engine troubles have been confined almost entirely to cracked cylinder heads and broken compressor shafts. The fracturing of the cylinder heads it was noted always occurred while maneuvering the engine in entering or leaving port, and never at sea while under way. It was discovered that this was caused by the overheating of the head, through the cutting off of the water cooling supply when the engine stopped, the circulating pump being driven off the main crankshaft, and the sudden cooling and contraction which took place when the engine started

again forcing the water through the head. This trouble has been entirely eliminated by devising means to keep a constant circulation of water through the cylinder heads while the engine is at rest.

The breaking of the compressor shaft which occurred in the first three installations only, was due to a mistake in the design which was quickly and easily rectified, and there has never been a recurrence of this trouble.

The Field for the Diesel Engine

It is not intended in this paper to advocate the internal combustion engine for passenger ships, or for vessels carrying highly valuable cargoes, such as silk or refrigerated products which on account of the large amount of capital invested and the extremely high rate of insurance, must be transported within the shortest possible time; this necessity for speed relegates the question of economy to a place of secondary importance, as such cargoes must be carried in large ships of high power, which is not possible at the present time, having regard to the development of the oil engine.

We take it for granted that merchant ships and steamers are operated for the purpose of profit, or carrying cargo at a minimum cost; therefore the hull that can carry the most cargo at the lowest cost—at the usual tramp speed—at about an equal outlay of capital, is the most economical. Trans-Pacific trade is the one that this coast is most seriously interested in. Developing and extending the export and import business with Australia, the Orient and South America, should be the particular endeavor of our Pacific Coast merchants and shipping companies, and to handle overseas goods and products, tonnage is absolutely necessary. On account of the distances, difficulty has been experienced in finding economical ships. An ordinary tramp steamer of 5000 deadweight tons inclusive of bunkers, on some voyages can carry only 3000 to 4000 tons actual freight paying cargoes, on account of the space taken up by bunkers or weight of fuel oil. A steel motorship of 3500 deadweight tons, 9 knots speed, carries on a direct voyage of 8000 to 10,000 knots, nearly as much revenue producing cargo (at a greatly reduced cost of operation) as a steel steamer of 5000 tons deadweight of the same speed, viz:

Motorship, d.w. tons.....	3500	Steamship, d.w. tons.....	500
Fuel oil engines:		Steam engines:	
Oil fuel for 45 days running at 5 tons per day	225	Coal fuel, 45 days at 25 tons per day.....	1125
Water for boiler.....	None	Water for boiler.....	100
	225 tons		1225 tons
Net paying cargo.....	3275 "	Net paying cargo.....	3875 "

At the close of the Civil War, the control of the world's shipping passed from America to England, one of the principal causes being the efficiency of the steel ship. There is every indication that this control will return to America. It can only be firmly retained if the American shipowner will take advantage of his present position and his relation to the fuel oil supply, and adopt the internal combustion engine.

HYDROELECTRIC ENERGY AND THE ELIMINATION OF WASTE

The following extract from an article by John P. Young, which appeared in the San Francisco Chronicle, ably points out some of the elements in the elimination-of-waste campaign which especially appeal to Westerners:

In a publication called "Fuel Facts," which has gone into a second edition, the United States Fuel Administration pointed out the condition which was entailing so much suffering during the very severe winter of 1917-18 was not a temporary one, although intensified by the extraordinary demands made upon railroad and other carriers by the necessity of moving vast quantities of material and great numbers of men to the other side of the Atlantic.

As a temporary measure of relief, it will be remembered, factories operating within a prescribed zone were forbidden to make extensions so that there would be no further encroachment on the supply of coal required to keep the people from freezing. Even with this restriction the situation was not sufficiently relieved to permit consumers to draw freely upon coal dealers and the population was practically put on rations.

The appearance of a second edition of "Fuel Facts" indicates that the cessation of hostilities has not been taken as a signal that precautions may be relaxed. On the contrary it distinctly conveys the impression that economy in the use of fuel must be practiced. It is filled with directions to the consumer how to save coal, all of which, doubtless, have the effect of reducing wastefulness, but it is clearly apparent that this excellent advice, combined with the deterrent effect of extremely high prices, will not do more than reduce the hardships the condition imposes, and therefore it cannot inspire any hope of future relief.

That this cannot be looked for, and that the condition is not a temporary one, is made clear by the statement that the population of the congested region is growing at an alarmingly rapid rate. A table prepared by the Provost Marshal-General in connection with the draft law shows that millions of people, all consumers of coal, are annually being added to the populations of the congested regions. Of course, the needs of these added millions greatly exceed the extraordinary demand for fuel occasioned by the war, and they will not cease with its cessation.

It is obvious that sifting the ashes with care, or unremitting attention to the damper, cannot remedy the matter. While the waste is being stopped at the spigot it is going on without interruption at the bung. The necessity of getting coal and raw materials to the factories of the East to keep them in operation, and to transport the foodstuffs consumed by the dense populations, implies immeasurably greater wastefulness. It accounts for nearly half of the almost 200,000,000 tons of coal annually burned by locomotives drawing the trains to distant points of consumption and in hauling the goods manufactured in those regions back to localities whence the raw materials and the fuel required to turn them into consumable goods were derived.

"Fuel Facts" in a circuitous fashion suggests that hydro-electric energy may ultimately play a great part, but it is too timid to dwell on the necessity which will soon confront manufacturers in the congested regions of abandoning those parts of the world in which the cost of production is becoming prohibitive for places where power can be obtained in abundance and cheaply, and where the raw materials required to utilize power can be produced. When the Washington bureaus rise to the desirability of removing all trammels from the development of hydro-electric energy they will be able to talk about the elimination of waste to some purpose.

NEW CHARTS FOR AERIAL SUSPENSIONS

BY JOSEPH N. LE CONTE

(The computation of sag constants in aerial design has proven an intricate yet important problem in the evolution of long distance transmission in the West. Here is a new method for accurately ascertaining this important information by means of charts. The writer is professor of engineering mechanics at the University of California. This article is abstracted from a paper delivered before a recent meeting of the San Francisco Section, A. I. E. E.—The Editor.)

Numerical computations involving the Catenary Curve are rendered troublesome by reason of the transcendental form in which the equation of the curve appears. This makes an exact algebraic solution impossible, and we must resort to either a more or less approximate algebraic solution, a solution by reference to tables or graphs, or a graphical construction. The first of these methods is usually based upon the parabolic approximation, and becomes more nearly exact as the catenary becomes

constructions are eliminated, and standard reference curves alone are used for the solution of equations. The following ideas have been kept in view. First, a very few curve sheets are made to cover all cases. This requirement has been met in the present instance by two such curve sheets. Second, the curves used should be single curves, i. e. one to each sheet, this one to cover all cases for which designed. This has been realized in all cases of the horizontal catenary (the catenary with supports at equal heights), and in all but one case of the general form, this last necessitating the set or "family" of curves shown in Plate II.

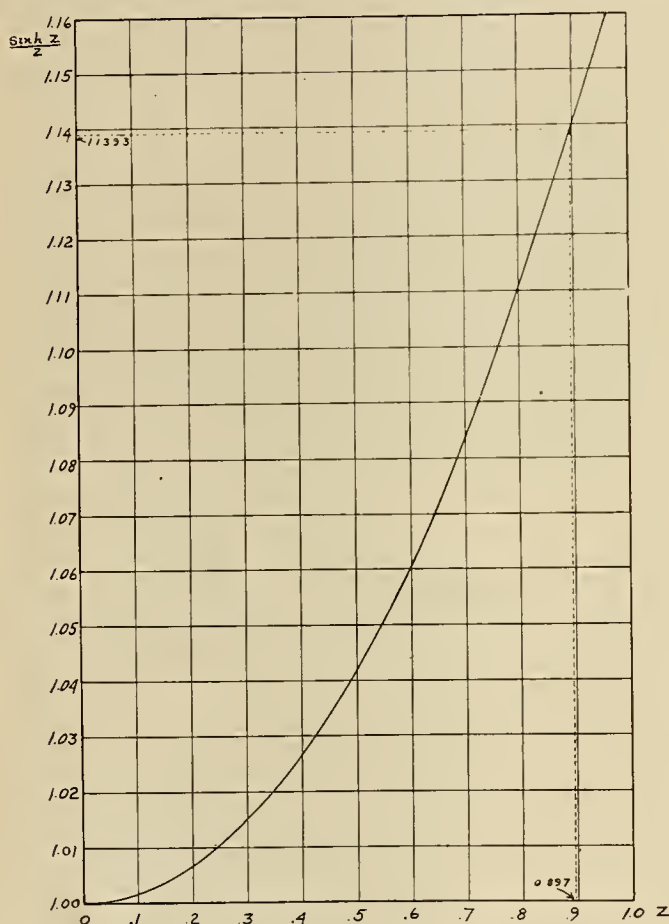


Plate I—A useful curve for the location of the lowest point in a suspension and the determination of the tension, or for the determination of the horizontal distance between supports and the location of the lowest point in a suspension. This is the problem which may arise in steel tape measurement.

flatter, that is more tensely drawn up, but will not apply with sufficient exactness to a slack span. The last method requires a new construction for each case, and is troublesome. It is by the second method, by reference to tables and to plotted graphs, that the following solutions are accomplished. An attempt is made here to solve all cases as far as possible by algebraic equations. When this is impossible, reference to tables and curves must be resorted to.

In regard to these latter it should be noted that, for the convenience of the computer, all graphical

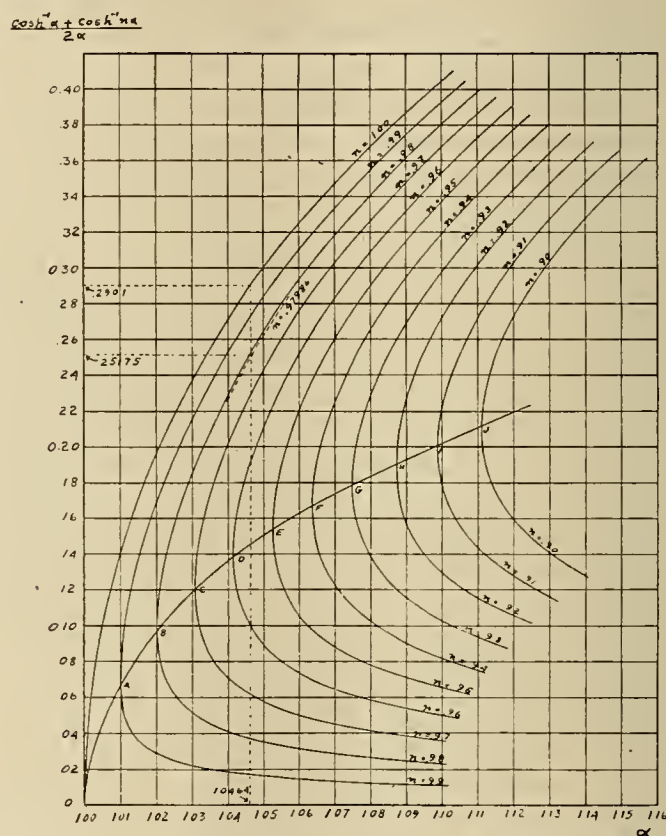


Plate II—A useful curve for ascertaining the length of wire between supports and the location of the lowest point in a suspension. Here we have the problem of determining the form, where the cable is drawn up to a known tension between given points of support.

It should especially be noted that all which follows applies to the mathematical catenary only, that is to say to the curve assumed by a cord or wire hanging between fixed supports, acted upon by gravity only, of uniform weight per unit of length, perfectly flexible as regards bending stresses, and perfectly rigid as regards tensile stresses. Due to the elastic nature of the materials of construction, an actual wire or cable does not satisfy these conditions exactly, in other words the length of the wire as hanging between supports, will not be the same as when lying unstressed on the ground, neither will

it hang up a true catenary. The mathematical catenary is, however, the basis of all preliminary calculation, and it is of this entirely that the following treats. Again, it must be remembered that in the cases of tight spans we are dealing with very large numerical quantities, and as the final solution involves the differences of large and nearly equal numbers, the calculation must be carried through with a high degree of refinement to insure even approximate accuracy. The curves shown on the two plates must be drawn with great accuracy and to a large scale. The samples shown on the printed pages can only give approximate results, neither is Plate II carried through sufficient range to cover all cases that might occur in practice. The computer should draw his own curves from the equations which follow. The numerical problems worked out in connection with the present discussion make use of curves plotted on paper having 1 inch main divisions, corresponding to the coordinate lines on the printed pages. These are further subdivided by ruling to 1/10 inch spacing. Plate I will then be about 13 x 22 inches, and Plate II if made in two parts overlapping on the same sheet, will be about 18 x 22 inches.

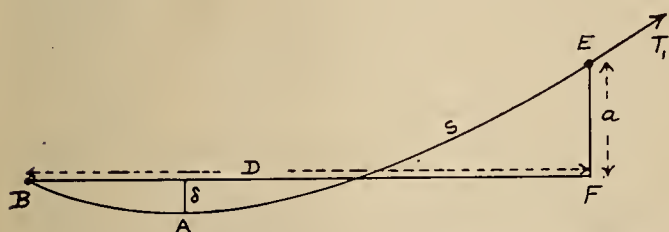


Fig. 1—The graphical relationship from which mathematical equations are deduced in sag formulas

In the practical solution of the catenary the quantities entering are:

- D, the horizontal distance in feet between supports
 - a, the difference in level in feet between supports
 - s, the total length of the wire in feet between supports
 - T_1 , the (larger) tension in pounds at the upper support
 - w, the weight per foot of the material assumed to be uniform
 - δ , the deflection in feet at the lowest point A below the lower support.
- This point may lie between supports as in Fig. 1, or on the prolongation of the curve beyond the lower support.

The three important cases that arise are:

I. Given D, a, and s, to find T_1 and the location of the lowest point A. This is evidently the problem of determining the form in which a given piece of material will hang between known points of support.

II. Given a, s, and T_1 , to find D and the location of A. This is the problem which may arise in steel tape measurement.

III. Given D, a, and T_1 , to find s and the location of A. Here we have the problem of determining the form, when the cable is drawn up to a known tension between given points of support.

In all the above cases the weight per foot of the material, i. e. w, is assumed as known and as constant throughout.

In order to deduce the equations that are here employed a knowledge of the relations of the hyperbolic functions is necessary, but such knowledge is not essential in order to use the curves and make the actual computations. The hyperbolic functions are used instead of the ordinary exponential func-

tions for the reason that they are more easily transformed and combined. A complete table of such functions is therefore necessary if the equations are to be computed by the methods which follow. A table sufficiently exact will be found among Smithsonian Mathematical tables¹.

The general relations between the various quantities are as follows. Refer the catenary curve to a set of rectangular coordinates, the axis Y being vertical, and through the lowest point of the curve, the axis X horizontal and at a distance C below the lowest point. This choice of origin O below the curve is made necessary by the form in which the equation appears, and the occurrence of this quantity C is one of the most troublesome features of the analysis.

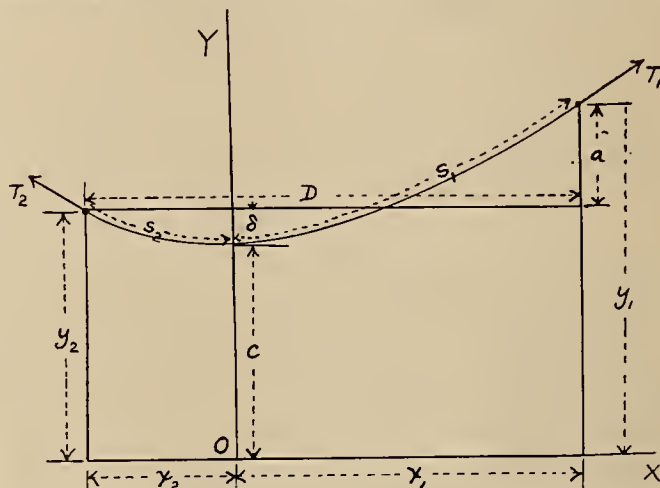


Fig. 2—The general graphical relationship of constants involved in suspension design as discussed in this article

Case I.—From the principles of mechanics we establish the relationship:

$$\frac{\sinh Z}{Z} = \frac{\sqrt{s^2 - a^2}}{D}$$

Although the right side of this equation is known, the equation cannot be solved for Z, due to its transcendental form, but it can be solved by a single curve, for the left side is a pure function of Z. We may draw a curve then as in Plate I whose ab-

scissas are Z and ordinates $\frac{\sinh Z}{Z}$, and for any

known value of the latter the former can be picked

off. As soon as Z is known, $C = \frac{D}{2Z}$ is known, and

then K can be computed from the relationship—

$$\frac{K}{2C} = \sinh^{-1} \frac{a}{\sqrt{s^2 - a^2}}$$

which can be found by direct reference to the tables of hyperbolic functions. It will be noted also that

if a is small compared with s, so that $\sinh \frac{K}{2C}$ is

¹"Hyperbolic Functions," by Geo. F. Becker and C. E. Van Orstrand, 1909. Published by the Smithsonian Institute, Washington, D. C.

small, then will $\sinh \frac{K}{2C} = \frac{K}{2C}$ nearly. Knowing

K , and D , x_1 and x_2 can now be computed, and then

y_1 and y_2 are obtained from $y_1 = c \cosh \frac{x_1}{c}$, etc.,

by means of the tables. Finally, $T_1 = wy_1$, $T_2 = wy_2$, $s_1 = \sqrt{y_1^2 - c^2}$, $s_2 = \sqrt{y_2^2 - c^2}$, $S = s_1 + s_2$. If the two supports are of equal height $a = 0$, $K = 0$, $\sinh Z = \frac{S}{Z}$, etc.

Case I—Example: Consider a span of copper wire, size 00, where $w = 0.4028$ lbs. per foot. Let $D = 500$ feet, $a = 20$ feet, and $s = 570$ feet. Then:

$$\frac{\sqrt{s^2 - a^2}}{D} = 1.1393 = \frac{\sinh Z}{Z}$$

from which by the aid of Plate I,

$$Z = 0.897 \quad 2Z = 1.794$$

$$C = \frac{D}{2Z} = 278.71$$

$$\sinh \frac{K}{2C} = \frac{a}{\sqrt{s^2 - a^2}} = .035109$$

This is so small that we may say

$$\frac{K}{2C} = .035109$$

So that $K = 19.570$ ft. $= x_1 - y_2$

But $D = 500$ ft. $= x_1 + x_2$

Hence $x_1 = 259.78$ ft. $x_2 = 240.22$ ft.

$$y_1 = C \cosh \frac{x_1}{C} = 408.80 \text{ ft.}$$

$$y_2 = C \cosh \frac{x_2}{C} = 388.80 \text{ ft.}$$

$$a = y_1 - y_2 = 20.00 \text{ ft. (check)}$$

$$T_1 = wy_1 = 164.6 \text{ lbs.} \quad T_2 = wy_2 = 156.6 \text{ lbs.}$$

$$\delta = y_2 - C = 110.09 \text{ ft.}$$

PRIMER OF INDUCTIVE INTERFERENCE

BY D. I. CONE

(A brief bibliography on the subject of Inductive Interference, compiled by a man who was closely associated with the work of the California Inductive Interference Committee and is in intimate touch with the subject. The article is the concluding one of a series which has been running through the Journal of Electricity covering the fundamental principles of this subject.—The Editor.)

Literature of the Subject

The great interest shown in inductive interference matters during the last few years has given rise to numerous published discussions. It is proposed here to mention a few of the later and more important ones, which afford the readiest means of acquiring familiarity with the present status. The series of brief discussions of which the present writing forms the conclusion have aimed to provide the

background of elementary facts, to make easier the understanding of more elaborate treatments.

Unquestionably the most complete study of inductive interference now available is the work of the California Joint Committee on Inductive Interference. The first report of that body to the California Railroad Commission was published in the Transactions, A. I. E. E., Vol. 33, p. 1441 (1914).^{*} The final report of the committee has just been published by the California Commission, and may be had from them in pamphlet form.[†] This report gives the results of the Committee's five years of study, with its conclusions and recommendations.

The technical studies of the California Joint Committee are very soon to be published in a volume of about 1000 pages, containing much valuable data. A fuller description of its scope is given in the Proceedings, A. I. E. E., Feb., 1918, p. 31, and Journal of Electricity, Dec. 15, 1917. It will contain the reports of the Joint Committee to the California Railroad Commission and the general order resulting therefrom. The final report is commended to all interested, and the larger technical volume, to those who wish to study the problem in more detail.

An interesting paper by George D. Shepardson entitled "Some Telephone Disturbances from Electrical Generators," Transactions, A. I. E. E., Vol. 15 (1898), p. 443, contains many references to the early studies of the subject.

"Telegraph and Telephone Systems as Affected by Alternating Current Lines," by J. B. Taylor, Transactions, A. I. E. E., Vol. 28 (1909), p. 1169, contains descriptions of many types of circuits and other data of fundamental interest.

"Inductive Interference as a Practical Problem," by A. H. Griswold and R. W. Mastick, Transactions, A. I. E. E., Vol. 35 (1916), reviews the case of transmission lines paralleling telephone lines, giving examples and suggestions for study of particular parallels.

A comprehensive treatment of the latest method of transposition of telephone lines, with reference to power circuits, is given by H. S. Osborne in the July, 1918, Proceedings, A. I. E. E.

"Inductive Effects of Alternating Current Railroads on Communication Circuits" are very helpfully discussed in the August, 1918, Proceedings, A. I. E. E., by H. S. Warren. Very interesting instances of the experience with such electrifications are given.

The two papers last mentioned have also appeared in the "Telephone Engineer." Many additional references may be found in the bibliography given in the Final Report of the California Joint Committee, already mentioned.

TELEPHONES THE WORLD OVER

The United States had 22,137,479 miles of telephone wire to 11,800,240 miles in all of Europe and its business has been extended since that time at a far greater rate. All of South America contented itself with 449,588 miles, while Africa had but 188,380 miles and Asia not much more in proportion to its size with 759,326 miles.

[†]See Journal of Electricity, Dec. 1, 1917, for summary.
^{*}See Journal of Electricity, Sept. 12, 1914.

WEIGHTS AND MEASURES OF LATIN AMERICA

BY FREDERICK A. HALSEY

(The man who is selling to South America or looking toward that field of trade will be interested in learning the extent to which the metric system is there prevalent and the demand for articles manufactured to that measure. The following is an extract from the report of the American Institute of Weights and Measures as it was presented before the annual convention of the A. S. M. E. and resolves itself into an argument against the adoption of the metric system. Without necessarily subscribing to this standpoint, it is here presented for the interest of our readers. The author is Commissioner of the American Institute of Weights and Measures.—The Editor.)

The inquiry of this paper is a portion of the report made to the A. S. M. E. at their annual meeting and was conducted through a questionnaire of which about 500 copies were distributed throughout South and Central America and the West Indies. The information given herein is not, however, limited to that obtained through the questionnaires as various citations in the text point out. In all cases, quotations without names attached are from the questionnaires.

Spanish and Portuguese Weights and Measures

As many readers are not acquainted with Spanish weights and measures, tables of the more common units and their relations are here given. The translation of the names is almost self-apparent, but the following are given:

Onza	Ounce	Pulgada	Inch
Libra	Pound	Pie	Foot
Tonelala	Ton	Vara	Yard
Quartillo	Quart		

SPANISH WEIGHTS AND MEASURES			
Weight		Dry Measure	
16 onzas	= 1 libra	4 cuartillos	= 1 celemin
25 libras	= 1 arroba	12 celemins	= 1 fanega
4 arrobas	= 1 quintal	12 fanegas	= 1 cahiz
20 quintales	= 1 tonelada		
Liquid Measure		Length	
4 cuartillos	= 1 azumbre	12 pulgadas	= 1 pie
8 azumbres	= 1 cantara	3 pies	= 1 vara
16 cantarar	= 1 moyo		

Unification of English and Spanish Weights and Measures

With slight differences in the values of the units, this system is substantially identical with our own. With suitable foresight and effort the two might have been unified long ago.

The chief difficulty in the adoption of the metric system in Latin America has been and is the psychological difficulty—that is, learning to think or visualize values in strange units. In this sense the difficulty of adopting the English values of the units would have been nil for there would have been little change in values to cause confusion of thought, while in names there would have been none. Meanwhile the still greater difficulty in our own case—the physical difficulty due to the anchorage of units in standardized manufacture—was and is absent in Latin America where but little manufacturing is done. The difficulties in the way of adopting the English values of the units thus were and are trifling in comparison with those in the way of adopting the metric units. The remaining question is: Is it too late? Except for units for land measure, which, once established, should be let alone, I think not, for conditions have not materially changed in Latin America. It must be apparent there, as this inquiry makes it here, that the attempt to adopt the metric system is a failure. The weights and measures of

Latin America are in a state of chaos, for which a remedy is sorely needed.

General Analysis of Results

The effort to learn the relative usage of the different systems has not been successful. When one return gives exclusive use of the metric system for a given purpose and another exclusive use of the Spanish system for the same purpose, discrimination is impossible. The thing here proven is that the claim that Latin America is metric is false, as are all arguments based upon it. In particular it should be noted that the order in which the units are herein named has no significance.

In but one of the countries investigated (Uruguay) can the metric system be said to be adopted for domestic trade, while there we find an authorized official exception in the case of real estate, as we find other exceptions in the cases of wearing apparel, industry, and navigation. Nevertheless, in twelve of these twenty countries, according to a report on The Metric System in Export Trade by the Director of the Bureau of Standards, the metric system is "obligatory."

In ten of these countries (apart from the railroads and other fields under immediate government control) the metric system has made almost no impression. (Nicaragua, Guatemala, Spanish Honduras, Cuba, Panama, Colombia, Porto Rico, San Salvador, Ecuador, and Costa Rica.)

Of these ten countries, according to the above report, the metric system is "obligatory" in seven. In five of them (Cuba, Colombia, Porto Rico, Panama, and Spanish Honduras) the English units are used far more than the metric, having largely supplanted all others, although in three of them, according to this same report, the metric system is "obligatory." Not only has the English pound come into large use, but the arroba and quintal have been adjusted in value to make them equal to 25 and 100 English pounds, respectively. In substantially all of the countries investigated the English inch is used for navigation and sea shipments. That most derided of English units—the nautical mile—is used by all countries that sail the seas and they use no other. The kilometer is an unknown measure at sea.

The farther we get from the field of retail trade, the less is the system used. In this field the progress is chiefly with units of weight and capacity, the measure of length for the sale of dry goods being commonly the vara, while imported wearing apparel of all kinds is commonly sold by the units of the country of its origin, by the inch at least as much as the centimeter, and domestic products are frequently made to numbered sizes, of which the relation to any

system of units is not apparent. They are not metric.

In primary or wholesale markets the old measures prevail, although these, in some cases, have been adjusted in value to make them even multiples of English basic units. We have here perfect examples of the simple process of unification of English and Spanish measures which, with proper encouragement, might by this time have become substantially universal.

Lumber and timber are almost universally sawn to the inch, although frequently mixed with the vara or the meter for length, and the square and cubic meter as sales units, prices being made at so much per square or cubic meter for one-inch boards.

In the mechanical trades tailors and seamstresses use all three systems, as do stone and brick masons, while carpenters commonly use the pulgada or inch. In machine shops both English and metric units are used, depending chiefly on the country of origin of the machines they have to repair. The inch is predominant.

In this connection we have the report of the Cleveland Twist Drill Company that shipments of their tools to South America are "95 per cent to 100 per cent English," and of the Detroit Twist Drill Company that "All of our South American customers use more English sizes than metric." Needless to say, English-sized twist drills are bought in order to make English-sized holes, for they will make no other.

In ship and boat building, also, the English units find large use, while in mining and smelting we find a miscellaneous mixture of all three systems.

The persistence of old units is most pronounced in the measurement of land. When units of measure are once anchored in titles to real estate, they are there to stay. Of this we have perfect examples in the use of the French arpent in Louisiana and the Spanish vara in Texas, in which states those units are today the common units of land measure. Another example is found in France, where, in some sections, the old units of land measure are still predominant.

When outlying districts are incorporated within city limits, parcels of land are much reduced in size and smaller units come in. This gives an opportunity for the introduction of the metric system, but with the result that, in the older portions of the town, the old units are used, while in the newer portions we find the new ones.

Similarly, initial surveys of the hinterland give an opportunity for the use of new units, but again with the result that the older portions of the country are measured in one set of units and the newer in another.

In Uruguay, where the laws are more severe and more rigidly enforced than in any other country, it has been found necessary to authorize the use of old units for the measurement of land, while in other countries the laws, in this application, are quietly ignored. This is the more significant because all transfers of real estate, as matters of public record, come before the eyes of officers of the law. In other countries, again, the purchase and sale are made in

Spanish units and the day is then saved by inserting metric equivalents in the documents of record.

In marine measurements and sea shipments the English system is used everywhere, although mixed with metric units, especially for inland navigation.

Classified in another way, the most-used metric units are those of capacity. Next come those of weight, and, trailing far in the rear, those of length and their correlatives of area. This is in accordance with a law which long ago made itself apparent.

The Result of a Great Series of Experiments

We have in this Report a composite picture of the result of many attempts to adopt the metric system, that result being uniformly the addition of that system to those previously prevailing, and it is this that we must contemplate as the result of the attempt to adopt it here. We must compare what we have with what we will get, not with what one may hope we will get. Moreover, it must be noted that had all these countries succeeded in this great experiment, it would have no significance for our guidance, because of the greater importance of our manufacturing industries. France adopted the system before the beginning of the manufacturing era, and Germany adopted it before the development of manufacturing in that country. Every one knows that the rise of Germany as a manufacturing nation began after the war of 1870. South American countries are not manufacturing countries. More manufacturing is done in the city of Philadelphia than in all South America.

We see, then, that in western Europe the system was adopted before the development of manufacturing and that manufacturing has developed with and in it, while in South America practically no manufacturing is carried on.

Great Britain and we are the first to be asked to change our manufacturing units, for which there is not a shadow of a precedent.

Seldom has an effort of such magnitude been made. We have here a record of twenty experiments on a national or, collectively, a continental, scale, and their net result is to demonstrate the wisdom of the conclusion arrived at by John Quincy Adams after four years of investigation and nearly a century ago:

"The substitution of an entire new system of weights and measures instead of one long established and in general use, is one of the most arduous exercises of legislative authority. There is, indeed, no difficulty in enacting and promulgating the law, but the difficulties of carrying it into execution are always great and have often proved insuperable."

Discussion of Weights and Measures

The discussion of Mr. Halsey's paper, from which extracts have been given above, is reported in the January issue of the Journal of the A. S. M. E. The paper evoked a very lively discussion, both sides being emphatic in the expression of their opinions. As usual with this topic there were two groups; Mr. Halsey and his supporters looked at the question from the viewpoint of the manufacturer and the machine shop, while the opposite group was influenced by the theoretical or scientific advantages that the metric system would bring about.

THE REGISTRATION OF PROFESSIONAL ENGINEERS

(The movement toward the licensing of engineers has come up in several of the western states. In anticipation of action by this year's State Legislature in California, the San Francisco Section of the A. S. C. E. in conjunction with each of the four local sections of the other national engineering societies, have prepared an Act which seems to meet the requirements. The text of this is given below and will prove of interest in view of like developments elsewhere throughout the West.—The Editor.)

The people of the State of California represented in Senate and Assembly, do enact as follows:

Section 1. Definitions. As used in this act:

1. The "board" means the state board of engineering examiners provided for by this act.

2. A person practices professional engineering within the meaning of this act who practices any branch of the profession of engineering other than military engineering. The practice of said profession embraces the design and the supervision of the construction of public and private utilities or works such as railroads, bridges, buildings, highways, roads, canals, tunnels, harbors, river improvements, lighthouses, wet docks, dry docks, ships, barges, dredges, cranes, floating docks and other floating property, the design and the supervision of the construction of steam engines, turbines, internal combustion engines and other mechanical structures, electrical machinery and apparatus, and of works for the development, transmission or application of power, power plants, the distribution of steam, water, gas and other elements, heating and ventilating, the examination of mining properties, the supervision of mining and metallurgical operations, and the design and construction of structures and works necessary to such operations, and the design and the supervision of construction of municipal works, irrigation works, water supply works, sewerage works, hydro-electric works, chemical works, valuations and appraisements, and structural works and other public or private utilities or works which require for their design or the supervision of their construction such experience and technical knowledge as are required in Section 7 of this act for admission to examination. The enumeration of any public or private utilities or works in this section shall not be construed as excluding any other public or private utilities or works which require such experience and technical knowledge for their design or the supervision of their construction. The execution as a contractor of work designed by a professional engineer or the supervision of the construction of such work as a foreman or superintendent for such a contractor shall not be deemed to be the practice of professional engineering within the meaning of this act.

3. "Professional engineer" means any person who practices professional engineering.

Sec. 2. Qualifications. After July 1st, nineteen hundred and twenty, no person shall practice professional engineering without having first been duly and regularly registered by the board as a professional engineer as required by this act nor shall any person practice professional engineering whose authority to practice is revoked by the board; and after July 1st, nineteen hundred and twenty, no diploma or certificate conferred on or granted to a person other than a certificate issued under this act by the board or its secretary shall be lawful authority for the practice of professional engineering.

Sec. 3. The State Board of Engineering Examiners. There shall be a state board of engineering examiners consisting of nine members to be appointed by the governor. Of the members of the board first appointed hereunder three shall hold office until July 1st, nineteen hundred and twenty-one, three shall hold office until July 1st, nineteen hundred and twenty-three, and three shall hold office until July 1st, nineteen hundred and twenty-five; and the term of office of each member so appointed shall begin on July 1st, nineteen hundred and nineteen. Upon the expiration of each of such

terms the term of office of each member thereafter shall be six years from July 1st. The governor may remove any member of the board for misconduct, incapacity or neglect of duty. Vacancies in the board caused by death, resignation or removal from office shall be filled by appointment by the governor for the unexpired term. Each member of the board shall be a professional engineer of at least ten years active experience and of recognized good standing in his profession, shall be at least thirty-five years of age and shall have been a resident of this state for at least one year immediately preceding his appointment. Each member of said board, except the members first appointed hereunder, shall also be a registered professional engineer. The members of the board shall serve without compensation except traveling and other necessary expenses.

Sec. 4. Certificate of Appointment; Oath; Powers. Every member of the board shall receive a certificate of his appointment from the governor and before beginning his term of office shall file with the secretary of state the constitutional oath of office. Each member of the board first appointed hereunder shall receive a certificate of registration under this act from said board. The board or any committee thereof shall be entitled to the counsel, advice and services of the attorney general, shall have power to compel the attendance of witnesses, and may take testimony and proofs concerning all matters within its jurisdiction. The board shall have an official seal to be furnished and provided by the secretary of state. The board may make all by-laws and rules not inconsistent with law needed in performing its duties; but no by-law or rule by which more than a majority vote is required for any specified action by the board shall be amended, suspended or repealed by a smaller vote than that required for action thereunder.

Sec. 5. Officers; Meetings; Quorum. The board shall biennially elect from its members a president and a vice-president for the ensuing biennial term. The board shall appoint a secretary, who shall not be a member of the board, but who shall possess the qualifications required by this act for members thereof. The secretary shall hold office during the pleasure of the board and shall receive such compensation as the board may decide. He shall give a bond in such amount and with such sureties as may be approved by the state comptroller conditioned for the faithful performance of his duties and for the accounting for, and payment over of, all moneys received by him. The secretary shall keep on file in the office of the board a record of all certificates of registration issued, and he shall receive and account for all fees derived from the operation of this act. He shall also perform such other duties as may from time to time be assigned to him by the board.

The board shall hold at least six stated meetings in each year. Special meetings may be called in such manner as the by-laws of the board may provide. Notice of all meetings shall be given in such manner as the by-laws of the board may provide. At any meeting of the board held solely for the examination of candidates for registration three members shall constitute a quorum; but if three or more members shall not attend at the time and place fixed for such meeting, the member or members present may adjourn the meeting from time to time until a quorum be present. At all other meetings a majority of the board shall constitute a quorum.

Sec. 6. Payment of Salaries and Expenses; Report. The fees derived from the operation of this act shall be paid

into the state treasury and held in a special fund. Warrants for the payment of salaries and expenses incurred shall be issued by the state comptroller and paid by the state treasurer out of the funds provided therefor upon presentation of vouchers regularly drawn and approved by the president and the secretary of the board.

On or before the first day of February of each year beginning in the year nineteen hundred and twenty the board shall submit to the legislature a written report of its proceedings for the preceding year and shall file with the secretary of state a copy of said report together with a complete statement of the receipts and expenditures of the board for the preceding year, verified by the oath of the secretary, and a complete list of all persons registered to practice professional engineering under this act with their addresses and the dates of their certificates of registration.

Sec. 7. Admissions to Examinations. The board shall admit to examination any candidate who pays a fee of five dollars and submits evidence, verified by oath and satisfactory to the board, that he

- (1) is more than twenty-one years of age,
- (2) is of good character, and
- (3) has been engaged upon engineering work for at least six years and during that period has had charge of engineering work, as principal or assistant, for at least one year.
- (4) or, in lieu of the third requirement specified above, is a graduate from an engineering school of recognized good reputation and has been engaged upon engineering work for at least four years and during that period has had charge of engineering work, as principal or assistant, for at least one year.

Sec. 8. Examination. Examinations for registration shall be held at stated or special meetings of the board at such times and at such places within this state in each year as the board shall determine. The scope of the examinations and the methods of procedure shall be prescribed by the board. The examinations may be either oral or written or partly oral and partly written. As soon as practicable after the close of each examination the members of the board who shall have conducted such examination shall make and sign and file in the office of the board a certificate stating the action of the board upon the application of each candidate, whereupon the secretary of the board shall notify each candidate of the result of his examination.

Sec. 9. Certificates of Registration. Upon receipt of an additional fee of twenty dollars the board shall issue to any applicant who has been certified as having passed the examination conducted by the board a certificate of registration signed by the president and the secretary of the board under the seal of the board, whereupon such applicant shall be authorized to practice professional engineering as defined by this act.

The board shall from time to time examine the requirements for the registration of professional engineers in other states, territories and countries and shall record those in which, in the judgment of the board, standards not lower than those provided by this act are maintained. The secretary of the board, upon the presentation to him by any person of satisfactory evidence that such person holds a certificate of registration issued to such person by proper authority in any such state, territory or country so recorded and upon receipt by him of a fee of twenty-five dollars, shall issue to such person a certificate of registration under this act signed by the secretary under the seal of the board, whereupon the person to whom such certificate is issued shall be entitled to all the rights and privileges conferred by a certificate issued after examination by the board.

Sec. 10. Registration without Examination. The board shall at any time on or before July 1st, nineteen hundred and twenty, issue a certificate of registration signed by the president and the secretary of the board under the seal of the board upon due application therefor and the payment of a fee of twenty-five dollars, to any candidate who shall submit evidence, verified by oath and satisfactory to the board, that he is of good character and has practiced professional engineer-

ing for at least ten years immediately preceding the date of his application and during that period has had charge of engineering work as principal or assistant for at least two years. After July 1st, nineteen hundred and twenty the board shall issue certificates of registration only upon examination as hereinbefore provided.

Sec. 11. Registry; Revocation and Reissue of Certificates of Registration. All certificates of registration issued by the board or its secretary shall be in such form as the by-laws of the board may prescribe. Before any certificate of registration is issued by the board or its secretary, it shall be numbered and recorded in a book kept for that purpose in the office of the board and the number of the certificate shall be noted on the certificate. Such record shall be open to public inspection and in all actions or proceedings in any court such record or a transcript of any part thereof certified by the secretary of the board under the seal of the board to be a true copy shall be entitled to admission in evidence.

The board shall have power at any time to inquire into the identity of any person claiming to be a registered professional engineer and after due service of a notice in writing, require him to prove to the satisfaction of the board, that he is the person authorized to practice professional engineering under the certificate of registration by virtue of which he claims the privilege of this act. When the board finds that a person claiming to be a professional engineer registered under this act is not in fact the person to whom the certificate of registration was issued, it shall reduce its findings to writing and file them in its office. Such findings shall be prima facie evidence that the person mentioned therein is falsely impersonating a professional engineer of a like or different name.

The board may revoke a certificate of a professional engineer for fraud or deceit in his practice or in the securing of his certificate or for the conviction of crime. Proceedings for the revocation of a certificate of registration shall be begun by filing with the board a written charge or charges against the accused. These charges may be preferred by any person or corporation or the board may on its own motion direct its secretary to prefer such charges. When charges are preferred against a professional engineer registered under the provisions of this act, the board shall designate not less than three of its number as a committee to hear and determine said charges. A time and place for the hearing shall be fixed by said committee and a copy of the charges together with a notice of the time and place for the hearing shall be served upon the accused or his counsel at least ten days before the date fixed for said hearing. Where personal service or service upon counsel cannot be effected and such fact is certified on oath by any person duly authorized to make legal service, the board shall cause to be published for at least seven times, the first publication to be at least thirty days prior to the hearing, in two newspapers published in the section of the state in which the accused was last known to practice, a notice to the effect that at a definite time and place a hearing will be had on the charges against the accused upon an application to revoke his certificate. At said hearing the accused shall have the right to cross-examine witnesses against him and to produce witnesses in his defense and to appear personally or by counsel. The said committee shall make a written report of its findings and recommendations and shall forthwith submit the same to the board. If the board shall find that said professional engineer has been guilty of any fraud or deceit in his practice or has been guilty of any fraud or deceit by which he was admitted to practice or has been convicted of crime, it shall revoke his certificate of registration. A two-thirds vote of all the members of the board shall be necessary for this action. The action of the board shall be recorded in the same manner as certificates of registration are recorded and the name of the person whose certificate of registration is so revoked shall be stricken from

the list of registered professional engineers and he shall be disqualified from practicing as professional engineer.

The board may re-issue a certificate of registration to any person whose certificate has been revoked, but only after the expiration of one year from the date of such revocation, for reasons which the board shall by a two-thirds vote of all its members determine to be satisfactory.

Sec. 12. Action of the Board. The members of the board or of any committee thereof and the secretary of the board in granting, withholding, revoking or re-issuing a certificate of registration shall be deemed to be acting as officers of the state and it shall be the duty of the attorney general to represent and appear for them or any of them in any action or proceeding brought against them or any of them because of any such act.

Sec. 13. Certificate Presumptive Evidence. Every unrevoked certificate and endorsement of registry made as provided in this act shall be presumptive evidence in all courts and places that the person named therein is legally registered.

Sec. 14. Penalties. Any person who not being then legally authorized to practice professional engineering within this state according to the provisions of this act and so registered according to law shall practice, or attempt or advertise to practice, or hold himself out as authorized to practice professional engineering or shall use in connection with his name or otherwise assume, use or advertise any title or designation tending to convey the impression that he is a professional engineer, and any person who shall buy, sell or fraudulently obtain any certificate of registration or who shall aid or abet such buying, selling or fraudulently obtaining or who shall practice, or attempt or advertise to practice or hold himself out as authorized to practice professional engineering under cover of any certificate obtained or issued fraudulently or unlawfully or under fraudulent representations or mistake of fact in a material regard and any person who shall practice, or attempt or advertise to practice, or hold himself out as authorized to practice professional engineering under a false or assumed name or who shall falsely impersonate any professional engineer or former professional engineer of a like or different name shall be guilty of a misdemeanor.

Sec. 15. Application of Act. This act shall not apply to any professional engineer working for the United States government; nor to any professional engineer employed as an assistant to a professional engineer registered under this act; nor to any professional engineer coming from without this state and employed therein until a sufficient time, as prescribed by the rules of the board, shall have elapsed to permit the registration of such person under this act, provided that before practicing within this state he shall have applied for the issuance to him of a certificate of registration and shall have paid the fee prescribed in this act for admission to examination.

Sec. 16. Appropriation. There shall be appropriated for the use of the board for the payment of salaries and expenses under this act from moneys not otherwise appropriated the sum of five thousand dollars.

Sec. 17. Time of Taking Effect. This act shall take effect on the first day of July, nineteen hundred and nineteen.

ITALY UTILIZES VOLCANIC POWER

The present enormous price of coal in Italy, according to the Italian Bureau of Public Information, has resulted in the realization of an idea which at first thought seemed but a dream, but which instead has been developed in a marvelous manner and is assuming quite considerable importance: This is the industrial exploitation of one of the features of vulcanism and that is the natural heat emitted from the soil in those regions more or less volcanic in character.

The first experiments along this line were made some years before the war by Prince Ginori-Conti in Tuscany at Larderello, near the salt-mines of Volterra, a region extensively covered with volcanic formations, the most wonderful being the so-called "soffioni," which are certain volcanic vents emitting powerful jets of very hot steam containing boric salts and various bases used in the extraction of boracic acid. Instead of limiting the use of these steam-jets, as in the past, to extracting the salts contained in the exhalations of these natural vapor-vents, the ejection of the steam is stimulated by boring holes. In this way it is possible to obtain powerful jets at a pressure of two or three atmospheres, according to the locality, and in some exceptional instances as high as five atmospheres, the temperatures varying from 150 to 165 degrees Centigrade. These jets maintain their force and temperature unchanged for many years, and they are not affected even when other openings, not too near each other, are bored in the ground, proving that they do not influence each other reciprocally, so great is the underlying thermic energy below. In 1905, Prince Ginori-Conti applied this natural steam to a 40 h.p. engine, using only a small section of the Nenella fissure, which is the most powerful "soffione," the steam ejected having a pressure of five atmospheres.

The results obtained during several years of experimentation were satisfactory, so that he continued to make larger and deeper borings, measuring the force of the steam ejected; combined, this force could operate engines of many thousand horsepower.

In 1912 an experiment was made, very wisely on a more modest scale but sufficient to obtain conclusive results, for which a 300 h.p. turbine-alternator was used.

Later, because of the enormous increase in the price of coal, the Prince decided to exploit the thermic energy of these soffioni on a much larger scale, but as other substances are emitted with the steam, among them sulphuric acid which corrodes metals, particularly iron, and therefore the pipes in which the steam was to be collected, he attempted to use this steam only for heating. Three turbine-alternators of 3,000 kilowatts each were installed, fed by boilers at low pressure not heated by coal or other combustible fuel, but by the natural steam, superheated to 165° C., issuing from these soffioni and piped and carried to the boilers.

Today the works at Larderello have a central plant of 16,000 h.p. operating without interruption and distributing current to Florence, Livorno and Grosseto; its capacity is soon to be increased.

Here we have a new and original utilization of Italy's natural wealth; current is generated not by the use of "white coal" (water-power), but by means of heat energy of volcanic origin.

As the natural steam available at Larderello and the surrounding country is, one might say, unlimited and depends upon the number of bore-holes made in the gorgiferous soil, the great possibilities for further development are readily seen.

THE SHOP COMMITTEE AND ITS FUNCTION

BY J. M. WADSWORTH

(An increase in output together with a saving in fuel is as much a necessity in peace times as in war. The good work initiated in the power plant by the U. S. Fuel Administration should not cease with the withdrawal of the patriotic stimulus. A suggestion of how interest in this matter may be kept up is here made by the man who was Administrative Engineer for the Fuel Administration in California.—The Editor.)

Although the incentive of war emergency is removed, the need for fuel and power conservation still exists. It is the hope of men who have devoted their energies towards these economies as a vital war measure that the work so initiated may continue and enlarge as a permanent and lasting benefit.

The public is acquainted with the necessity and advantage to be gained by careful administration and use of our national resources.

It is the purpose of this article to develop a practical plan for instituting these economies in the industries. The U. S. Fuel Administration in conducting its work has endeavored to secure the appointment of a committee of employes from the personnel of each company for the conservation of fuel and power used by that company. The work has been greatly facilitated and a lively interest stimulated by the voluntary efforts of these men on analyzing and studying their own plants and labors for increased productiveness at lessened cost. In fact, the practical advantages gained have been so tangible and the savings accomplished so material, that many companies have retained their committees in force permanently. This is as it should be. Plant owners should appoint an individual or a committee to study conditions in the boiler and engine room and throughout the plant. The duties should be the organization of and carrying out of methods for the prevention of waste and increase of plant effectiveness.

During the war incentive enough existed to encourage the work, but now with that stimulus removed something else must replace it. Some form of bonus arrangement should be instituted whereby a portion of the saving made should be apportioned among the men instrumental in accomplishing it. That this plan should not react to the benefit of the committee men alone, who no doubt will owe their results to the good work of many operators, it is believed that the bonus system should apply in general throughout the plant. That is, the committee should study each department and determine the normal output of each worker or department as closely as possible. Then, each should receive a bonus for increased output. In this way an interest will be aroused and a loyalty encouraged towards the aims of the committee and company. In addition, annual bonuses should be apportioned to the committee and the departments affected by the savings accomplished during the year.

For these purposes a most accurate knowledge of the business is necessary and regular daily or weekly records of all departments made. The writer has no hesitancy in saying that the benefits derived

by an owner through added loyalty and satisfaction of his employes and increased knowledge of the items entering into operating costs of his plant departments will be stupendous.

The Fuel Administration in first recommending the committees expected their duties would be solely in connection with the use of fuel and power. With this in mind, a circular was issued to all power plants, which included the following hints to committeemen:

"The wide variation in conditions surrounding the use of power, light and heat is against any arbitrary rulings governing shop operations. The following points, however, should in a general way be of assistance to your committee:

Eliminate operation of motors when machines are idle, by means of convenient switches.

Group machines, so that driving motors or engines operate at their highest efficiency.

See that all bearings are regularly oiled and inspected to correct alignment and insure operation with least friction.

Eliminate belt slippage, so far as possible.

Stagger manufacturing operations so that peak loads will be flattened as much as possible.

In alternating current installations, provide means for improving the power-factor conditions.

Reduce elevator service to a minimum.

Reduce hot water to a minimum.

Stop all leakage in water spigots, pipes, etc.

Reduce number of lights wherever practicable. Reduce candle power of lights wherever possible.

Eliminate use of carbon lamps and replace with mazda or other high efficiency lamps.

Eliminate arc lamps by using lighting units of more efficient type.

Provide a thermometer in different parts of the shop and make arrangements to keep the temperature within reasonable limits.

Eliminate heating radiators or piping not in actual use.

Wherever possible provide storm doors and storm windows on all openings, used during winter months."

The notice concluded to the effect that many other ways to effect conservation would, no doubt, be devised by the committees.

This increased scope of the committees is only hinted at in this article. A careful study will enable a committee to outline improvements and institute economies not apparent, except from such study. Very possibly, in many plants, it would be exceedingly difficult or impractical to effect a bonus system to the individual. However, in such cases his department might easily be so handled and the bonus then apportioned in the department.

Finally, the increase in effectiveness and loyalty among the employes through the creation of such a committee is cause enough for its existence, and if correctly chosen, the results attained will quickly justify its continuance.

REVIVING OIL WELLS BY ELECTRICITY

The cooling of oil beds due to ingress of air sometimes thickens the crude oil and prevents its flow. The recently devised method of applying an electric current to the warming of the oil offers special advantages over hot water or steam which can only be used at moderate depths. The oil is heated without loss, and, much gas being generated, a pressure is set up which in some cases has forced the oil to the surface in bore-holes of great depth.

SPARKS—Current Facts, Figures and Fancy

(Japan, France, Italy, South America, Australia, Germany and England all are represented in these items of electrical interest. An annual report submitted in moving pictures in Louisville, and deep diving in the Sierras as a part of Western hydroelectric development are also noted.—The Editor.)

The shortage of material in Germany is only now being realized. At a recent exhibition at Frankfurt, substitutes for leather were especially prominent. Among the materials used for the soling of shoes was rubber, felt, wood, paper and a new compound, perhaps the most successful, in which nitroglycerine forms an important part.

* * *

The difficulties of finding employment for the vast industrial plants of war time seems not to be the greatest problem of England, but rather to find enough factories to meet her peace time demand. In spite of the vast steel works in existence, a new steel company has recently been formed of which the capital will soon be increased from five to twenty-five millions.

* * *

Water power has been put to more uses than the generation of electricity. The Italian government supplies its army with little coffee grinders and whole berries—and during the Alpine campaign the ingenious carabinieri hitched their grinders to the busy mountain streams and had their coffee prepared by water power. The energy saved was not great, but the fact that the device worked gave them a great deal of satisfaction.

* * *

Scholarships for scientific investigators to the sum of 115,000 yen for this fiscal year have been voted by the Japanese diet. A sum of from 500 to 10,000 yen is given to each investigator. Among the subjects of study relating to electricity are: The vacuum and its application, the spectrum study of the X-ray and light, generation of high voltage and vacuum discharge, and the electrical study of biology.

* * *

The part America may play in France's rehabilitation is told by a prominent business man of Paris who explains that before the war all machinery, from lighting fixtures to motors and printing presses, were obtained from Germany, but that now the United States will be the market. Over 200 million francs will be required in textile machinery alone, according to this expert, practically all of which America can supply if she will.

* * *

Based on the budget of a normal family, Australia alone of all the great countries has had a lower average increase in the cost of foodstuffs than the

United States. From July, 1914, to September, 1918, increases were as follows: Australia 30 per cent, United States 60 to 70 per cent, Holland 70 per cent, Denmark 80 per cent, Great Britain 104 per cent, Germany, Belgium, Norway and Hungary, 150 to 200 per cent, Austria, Finland and Russia more than 200 per cent.

* * *

It is reported in the London Times that the coal production in the United States is 477,000,000 tons per year, with only 723,000 persons employed; while the United Kingdom production, on the other hand, is only 260,000,000 tons, and 1,069,000 people are employed. In other words, United States production per man is 819 tons and the United Kingdom production per man only 249 tons. This is, of course, due in part to our wasteful methods of mining.

* * *

The troubles of the telephone companies in the tropics are legion. Wooden poles are practically out of the question owing to the wood-eating ant and the bird life which honeycombs the poles. A new difficulty is now reported from Porto Rico in the growth of aerial plant life along the wires. These little plants of various varieties derive all their sustenance from the air and offer much the same problem to the telephone company as a heavy fall of snow in a northern climate.

* * *

Friendly relations between nations are greatly promoted by the moving picture, according to one business man from South America. The United States is particularly fortunate in this respect as American films are everywhere popular and the foreign countries become intimately familiar with American customs and appearance and feel a real brotherly interest in a people whose emotions and actions are so evidently but little different from their own.

* * *

An annual report rendered in moving pictures is the innovation inaugurated by the general manager of the Louisville Industrial Foundation. After the cinematographic review is presented to the stockholders, it will then be exhibited at the various motion picture theatres in the city of Louisville. The use of the film in merchandising is quite popular now but its adoption as a means of presenting a clear and impressive record of the accomplishments of an industrial development organization is said to be without precedent.

PERSONALS

H. J. Gille, salesmanager of the Puget Sound Traction Light & Power Company, comes to his new office as president of the Northwest Electric Light and Power Association with unusual qualifications for piloting the affairs of that organization through the difficult problems that await solution in the power industry of the West. Mr. Gille has actively been engaged in the electrical industry in the West for many years and as one of its sturdy pioneers he has especially been active in bringing to his district new industries and new commercial enterprises.



His vision in formulating a constructive commercial policy for his company has largely been the factor that has aided so wonderfully in building up a reputation for sane, conservative building and yet in creating an industrial empire in and around Seattle that in many respects has made that city the most important commercial and industrial center west of the Rocky Mountains.

J. D. Bush, manager of the telephone company at Santa Barbara, was a recent San Francisco visitor.

F. E. Weymouth, chief of construction of the reclamation service, Washington, has been in San Francisco recently on business.

J. W. Redpath and M. A. De Lew have both been recent sufferers from the prevailing epidemic. Mr. De Lew is again about his business and Mr. Redpath is reported better.

H. W. Crozier, mechanical and electrical engineer for Sanderson & Porter, has been named a trustee of the Mechanics Institute of San Francisco.

Captain Harold Yost, formerly in the distribution department of the Pacific Gas & Electric Company, has arrived in Berkeley, Cal., from Camp Lewis, Wash.

Elmer Dover, vice-president of H. M. Byllesby & Company, in charge of the Byllesby properties in the Pacific Northwest, has resigned, effective February 1st.

Major C. E. Hickok, formerly city engineer of Alameda, Cal., is en route from Washington, D. C., for Alameda, where he will resume his former duties as city engineer.

John R. Brownell, superintendent of the California Industrial Accident Commission, has recently gone to Washington, D. C., to attend a conference on safety matters.

Colonel Chas. N. Black of the Ordnance Department, U. S. A., who was formerly general manager of the United Railways of San Francisco, is a recent San Francisco visitor.

S. Waldo Coleman, president and general manager of the Coast Counties Gas & Electric Company, has been re-elected a director of the Italian-American Bank in San Francisco.

Francis Maslin, formerly connected with the Alameda district of the Pacific Gas & Electric Company but now an engineer in the American Expeditionary Forces, has returned to Pensacola, Fla.

Captain Chas. H. Lee, formerly an engineer with the Los Angeles Aqueduct, who contributed noteworthy articles to the Journal of Electricity on precipitation in the Southern Sierra Nevada Mountains of California, was engaged in water supply work for animals and men of the First Army front during both the St. Mihiel and Verdun drives, August 24 to November 11, 1918.

F. D. Nims, vice-president and general manager of the Washington Coast Utilities recently returned from a six-weeks business trip. Boston and Chicago were the chief points in his itinerary.

W. D. Sultan, lieutenant of engineers, formerly in the office of A. F. Hockenbeamer, vice-president of the Pacific Gas & Electric Company, is again a civilian, with his former position in San Francisco.

Archie J. Twogood, recently with the electrical engineering department of the Southern Pacific Company, is now assisting with the technical instruction in the Department of Education of the Portland Y. M. C. A.

Jean A. Hardel, a mechanical engineer from Paris, France, has returned after making an exhaustive investigation of coal and fuel oil firing throughout the United States, including the Pacific Coast territory.

Robert L. Eltringham, electrical engineer for the California Industrial Accident Commission, suffered an attack of the influenza during the last month but his friends are glad to see that he has recovered and is back at his work.

A. Emory Wishon, assistant general manager of San Joaquin Light & Power Corporation, after spending two weeks at St. Luke's Hospital in San Francisco with an attack of influenza is now well on the road to recovery.

C. M. Brewer, manager of the Richmond division of the Western States Gas & Electric Company, has been appointed vice-president and general manager of the Mountain States Power Company, operating in Montana, Idaho, Washington and Oregon.

R. H. Ballard, vice-president, and A. N. Kemp, controller of the Southern California Edison Company, recently spent some days in San Francisco where they succeeded in having a sixteen million dollar bond issue approved by the Railroad Commission.

D. J. Young, of the San Diego Consolidated Gas & Electric Company, San Diego, California, has been appointed vice-president and general manager of the Tacoma Gas & Fuel Company, Tacoma, Wash., Olympia Gas Company, Olympia, Wash., and the Puget Sound Gas Company, Everett, Wash. All of these appointments were effective January 1, 1919.

J. L. White, formerly manager of the Oregon Power Company at Albany, and W. L. McCulloch, who was mechanical superintendent and chief engineer of the Oregon Power Company, hold the positions respectively of vice-president and secretary of the Pacific Coast Asbestos and Supply Company of Portland and Seattle, which organization has recently taken over the local branch of the Pacific Mill and Mine Supply Company.

Major David P. Mason, professor of forestry at the University of California, has returned to his university duties

after an absence of eighteen months, during the larger proportion of which time he was engaged with the forestry work in France, having been promoted from Captain of Engineers to the rank of Major in the Tenth Regiment of Engineers. Mr. Mason's work was largely in southwestern France where a vast system of pines had been planted by the French government in former years to protect the seacoast from the



formation of unwieldy sand dunes and their consequent changing of the coast line of France. The calling upon this vast supply of timber aided effectively in the saving of the republic by the ready furnishing of much needed timber supplies.

J. W. Thompson has succeeded Sam Russel as manager of the electrical departments of the H. W. Johns-Manville Company at San Francisco.

Chas. G. Hyde, professor of sanitary engineering at the University of California, who has been engaged in national service during the past several months, is again back at his university duties.

R. V. Mills, petroleum technologist of the Bureau of Mines, has returned to the San Francisco office of the Bureau after an extended trip through the eastern and mid-continent oil fields.

F. B. Tough, petroleum technologist of the U. S. Bureau of Mines, with headquarters at the San Francisco office of the Bureau, has returned to California after several months absence in Wyoming and other oil fields, where he has been acting as Special Agent for the Secretary of the Interior in the supervision of oil drilling operations being conducted on public lands.

J. H. Wiggins, petroleum engineer of the U. S. Bureau of Mines, with headquarters at the Bartlesville Station of the Bureau, spent several days during December at the San Francisco office of the Bureau, arranging with officials at that station the details of a plan for making a systematic study of the losses of oil by evaporation between the oil well and the refinery.

Arnold Pfau, consulting engineer in the hydraulic department with the Allis-Chalmers Manufacturing Company and familiar to readers of the Journal of Electricity through his articles on high head turbines, recently passed through San Francisco on his way back from the Orient where he has spent some time.

E. J. Richards, formerly chief electrical engineer for the Arizona Hercules Copper Company situated at Ray, Arizona, is a recent San Francisco visitor. Mr. Richards has recently superintended the installation of three one thousand h.p. Diesel engine units for the Hercules Copper Company.

K. E. Van Kuran, Los Angeles manager of the Westinghouse Electric & Manufacturing Company, has been appointed a member of the Advisory Committee of the California Electrical Cooperative Campaign as an additional representation on that committee of the electric manufacturers.

Lieutenant Willis L. Winter, formerly in the employ of the Westinghouse Electric & Manufacturing Company but more recently in the fighting in the Argonne in France, where he had many interesting experiences in the Signal Corps, is again a private citizen and spending a few days at his San Francisco home.

Chas. A. Rolfe of Redlands, California, has been appointed chairman of the California District of the independent group of telephone companies under Federal control, to assist in carrying out a systematic method of dealing with independent companies to the end that the very best service be given the public.

John A. Britton, vice-president and manager of the Pacific Gas Electric Company, recently spoke to the manufacturers of the San Francisco bay region at a luncheon of the Home Industry League, at which he pointed out the necessity for national legislation which would permit the development of our water resources through private enterprise.

W. H. Hamer, a member of the Institute of Civil Engineers, who is chief engineer of the Port of Auckland, N. Z., is a recent San Francisco visitor. Mr. Hamer is one of the world's best known authorities on reinforced concrete pier construction. He has been making an inspection of work of this nature, including concrete ship construction, in various seaports of America. He is now en route home.

Robt. Larsen, Oregon representative of the Pacific Division of the National Electrical Contractors and Dealers Association, J. F. NePage, delegate from Washington, and J. W. Oberender, efficient secretary, recently attended the

Pacific Division meeting at Sacramento. Mr. NePage was taken with the influenza while in Sacramento and for a time was very low, but is now on the convalescent list.

Sam C. Bratton, for the past eight years commercial manager of the Portland Gas & Coke Company, left Portland about January 15 for New York, where he has been appointed manager of the commercial department of the Electric Bond & Share Company of New York, which is banker and fiscal agent for the American Power & Light Company and its many operating companies, of which the Portland Gas & Coke Company and the Pacific Power & Light Company are a part.

G. E. Pingree has been appointed as vice-president and general manager of the International Western Electric Company, Inc., and vice-president and managing director of the Western Electric Company, Ltd., Canada, succeeding Gerard Swope, who has resigned to take the position of head of the International General Electric Corporation. Mr. Pingree has been frequently in the West. He went to China in 1908 as the company's special representative in the Far East and is eminently familiar with that field.

OBITUARY

W. B. Burbeck, formerly in the distribution department of the Pacific Gas & Electric Company and, since returning from the Aviation Service, more recently in the commercial department of this company, died of influenza during the past semi-monthly period. Mr. Burbeck was to have been the new field agent of the California Electrical Cooperative Campaign, in charge of the San Francisco district.

It is with regret that the recent death of D. L. Reynolds, of the Graham-Reynolds Electric Company of Los Angeles, is here recorded. Mr. Reynolds had been in poor health for some time and the ravages of influenza, followed by pneumonia, was more than he could stand. Duncan L. Reynolds came to Pasadena, California, in 1893, when his father, Henry J. Reynolds, retired from connection with the Michigan Agricultural College and brought his family to California. He was born in Old Mission, Michigan, October 2, 1879, and was the third in a family of five sons and two daughters. He



went through high school at Pasadena and at the age of 17 went to Baltimore to study dentistry. He graduated from the Baltimore Dental College in 1901, the highest in his class.

Returning immediately to Pasadena, he married Miss Estelle R. Wallace, daughter of Mr. and Mrs. J. C. Wallace of Alhambra and sister of Mrs. S. M. Kennedy, wife of the well-known general agent of the Southern California Edison Company. He then started to practice his profession. After nearly four years of successful work his health required him to give up dentistry and then for the first time he became interested in the electrical business through his brother, Robert L. Reynolds, and soon after became a member of the firm of Holabird Reynolds Electric Company, now the Graham-Reynolds Electric Company, where he has been associated in business with Mr. N. W. Graham for the past fifteen years.

Besides his wife he leaves a fourteen year old daughter, Frances, and a son, Henry J. Reynolds II.

He was an Elk and a Mason and a member of the Jonathan Club of Los Angeles, also a member of the Midwick Country Club of Alhambra, where he was an enthusiastic outdoor man and an especial lover of sport of every kind.

MEETING NOTICES FOR ELECTRICAL MEN

(Unusual activity in western electrical organizations is reported in spite of sporadic remainders of the influenza epidemic. Highway and irrigation conventions have been held in the Northwest and a meeting of the Pacific Division of the National Electrical Contractors and Dealers' Association in Sacramento. A convention of the jobbers is announced for the middle of February and plans are already well under way for the Pacific Coast Section, N. E. L. A. convention of which the date has been set for April 30 to May 2.—The Editor.)

Forthcoming Meetings of Great Helpfulness

THE TIME: April 30 to May 2, 1919.

THE PLACE: Hotel Del Coronado, California.

THE EVENT: The combined electrical conventions of Pacific Coast Section, N. E. L. A., California Association of Electrical Contractors and Dealers, Pacific Division National Association of Electrical Supply Jobbers.

WHAT TO DO ABOUT IT: Plan to make it the one event of the year that you will attend.

Victory Convention, Pacific Coast Section, N. E. L. A.

April 30-May 2 inclusive are the dates for the third annual convention, Pacific Coast Section National Electric Light Association, as determined at an Executive Committee meeting, Los Angeles, Jan. 18th. The convention will be held at Hotel del Coronado, Coronado, California, upon the invitation of H. H. Jones, manager of the San Diego Consolidated Gas and Electric Company and chairman of the convention committee.

Due to illness, Mr. Jones has not yet announced the personnel of this committee but has secured assurances from the management of the Hotel del Coronado that ample accommodations will be available for the large crowd that is expected to attend. The maximum rate will be \$5.50 per day for one person occupying room and bath. All meetings will be held in the hotel, which is admirably arranged for the purpose.

A large attendance is already assured, not only because of the members' interest in the great Victory Convention, but also by the fact that the quarterly meetings of the California Association of Electrical Contractors and Dealers and of the Pacific Coast Electrical Supply Jobbers' Association are to be held at the same time and place. The Westinghouse Agent-Jobbers' Association will also schedule a special train from Chicago so that its members may attend this meeting prior to their own annual gathering at Del Monte, May 4-11. This means an additional attendance of 60 or 70 jobbers from all parts of the country.

There is talk, furthermore, of chartering a steamboat from San Francisco to San Diego with a stop at San Pedro so that every one can go to and from the meetings together, with all the attendant advantage of greater opportunity for acquaintanceship.

All the papers to be read at the convention will be printed in the Journal of Electricity of April 15th, a copy of which will be mailed to members in ample time to prepare discussion. The papers will not be read at the meeting, thus

allowing full time for discussion. An excellent set of papers and reports dealing with the pressing problems of after-the-war readjustment is being worked out by the engineering, commercial, publicity and public policy committees.

Pacific Coast Division, N. A. C. D.

The Pacific Coast Division of the National Association of Electrical Contractors and Dealers convened at Sacramento on Friday and Saturday, Jan. 10 and 11, 1919. W. D. Kohlway as divisional chairman was in the chair. J. F. NePage represented Washington, Robt. Larsen, Oregon, H. C. Reid, California, and J. W. Oberender of Portland acted as secretary. Routine business occupied the major time of the meeting.

Officers were elected as follows: W. D. Kohlway, Chairman Pacific Division, J. F. NePage, Secretary, and J. R. Tomlinson, national representative from Oregon to replace Sam Jaggard, whose term expired with this year. Later the convention was merged into a joint meeting with the California State Contractors and Dealers' Association. W. D. Kohlway and J. F. NePage were to have gone to the national convention at Pittsburgh immediately following the meeting, but owing to the illness of Mr. NePage, who was taken with influenza, the trip was not undertaken. The western delegates forwarded a telegram to the national convention conveying their message and urging the classification of trade according to the Goodwin Plan.

Pacific Division, Supply Jobbers

The annual meeting of the Pacific Division Electrical Supply Jobbers' Association,

to be held at Del Monte Feb. 13-15, is announced in the following picturesque communication:

Remember that now the War's over all Divisions of People are Pacific but since you are not invited to the Peace Table, come to the one where you are invited. Annual election of officers. Who Knows, You may be chosen as a General in the Pacific Coast Army of Electricians. "The Absent are never chosen."—Timothy 10-17.

San Francisco Electrical Development League

The meeting of the Electrical Development League of San Francisco, held on January 20, 1919, was to have featured the "Adjustment of Utility Regulation," with the members of the California Railroad Commission as guests of honor and speakers of the day. At the last minute, however, the commission was detained in Sacramento. An impromptu program, however, provided a very satisfactory substitute. John A. Britton spoke briefly on the history of the utility commission movement in California, the opposition to it in early days and the present general satisfaction with the institution. L. H. Newbert gave a report of progress on the California Electrical Cooperative Campaign and A. H. Hal-

BUILDERS OF THE WEST—XLVI



T. A. RICKARD

The mines of the West, from the golden days of 'forty-nine to the magnificent era of the present in production of gold, silver, copper, lead and petroleum have not only dazzled the world with their richness but in the trying years just past they proved of invaluable aid in safeguarding the freedom of its peoples. Beneath this material manifestation there has ever been an underlying spirit of freedom, of hope and of courage that has permeated the great mining industry to an extent experienced in no other line of human activity. To T. A. Rickard, editor of the Mining and Scientific Press, an engineer and writer of the first order, this issue of the Journal of Electricity is dedicated not only for the splendid ideals of constructive helpfulness that pervade his writings, but for the lasting good he has performed in recent months in pointing out the similarity and close union of ideals of this country with those of all the great English-speaking peoples.

Ioran briefly reported on the plans for the N. E. L. A. convention in Coronado this spring. Senator Cutten gave a short resume of Commission activities and spoke appreciatively of the support which had been given the Railroad Commission by the public in the recent raising of rates. The only protests, he said, had come from those enjoying special privileges previous to war times.

Northwest Electric Light and Power Association

The Executive Committee of the Northwest Electric Light and Power Association met recently in Seattle to consider matters of importance to the association. They will endeavor to meet once each month, the next session to be in Portland the middle of February.

Joint Meeting—San Francisco

A Joint Meeting of the San Francisco sections of the national engineering societies was held under the auspices of the American Institute of Electrical Engineers, at The Engineers' Club, 57 Post street, Friday, January 24, at 7 p.m. The subject of the meeting was "A Symposium on Engineering Education," which was discussed by J. W. Beckman, American Chemical Society, John A. Britton, American Society of Mechanical Engineers, C. L. Cory, American Institute of Electrical Engineers, C. D. Marx, American Society of Civil Engineers, and T. A. Rickard, American Institute of Mining Engineers.

The subject under consideration was one of considerable importance, especially at this time, as it is incumbent upon the engineering profession to do its duty in the reconstruction days following the war, and a most interesting discussion developed.

Portland Local Contractors and Dealers

The regular meeting of the Portland District Association of Electrical Contractors and Dealers was held at room 248, Oregon Hotel, Monday evening, January 6, 1919. The Executive Committee reported holding a meeting on Dec. 31, 1918, and appointing the following members to the respective offices and committees:

Chairman Local Association, R. C. Kenney; State Association Committee, F. C. Green; Membership Committee, J. H. Sroufe; Finance Committee, E. L. Knight; Legislative Committee, F. C. Green; Costs and Merchandise Committee, C. P. Scott; Investigating and Adjusting Committee, W. O. Fouch; Entertainment Committee, S. C. Jaggar; Member to the State Executive Committee, J. R. Tomlinson; Treasurer, F. A. Bauman, and Secretary, J. W. Oberlander.

The fixture section reported having compiled a new blue print of statements which would be distributed among the members in a short time.

J. C. English reported having been called upon by members of the House-wiring Committee of Portland and explained what was expected of members of the association. Upon motion duly made and carried the association recommended and endorsed the movement and campaign now being promoted and to be carried on under the name of "Your Own Home" campaign. A committee of three was appointed to collect contributions to the support of this campaign.

In the matter of the installation of fire alarm gongs, it was the opinion that such installations should be recommended as would most efficiently provide for a safe and workmanlike installation, but that no discrimination should be made as to the using of battery systems where the owner insisted upon these being used.

Idaho Irrigation Congress

The Idaho Irrigation Congress was held at Twin Falls to consider changes in Idaho's water code, and to make recommendations to the state legislatures for changes in existing irrigation laws. Speakers included A. E. Chandler, president of the California Water Commission; J. B. True, State Engineer of Wyoming; Percy A. Copper, State Engineer of Ore-

gon, and Prof. O. L. Waller, vice-president of the Washington State College.

American Gear Manufacturers

A meeting of the Standardization Committee of the American Gear Manufacturers' Association was held at Hotel Statler, Buffalo, N. Y., January 13 and 14, 1919.

American Institute of Electrical Engineers

Denver Section—

The regular meeting held Jan. 18, 1919 at the Denver Athletic Club featured the subject of "The Future of the Public Utilities as Affected by the War." The speaker of the evening was Franklin P. Wood, Engineer of Trinidad, Colorado, and F. W. Held and E. A. West of the Denver Tramway Company later led the discussion.

Spokane Section—

A joint meeting was held between the local section A. I. E. E. and the A. S. C. E. and the Spokane Engineering and Technical Association at 8 p.m., Jan. 17, 1919, at the Chamber of Commerce assembly room. J. C. Ralston addressed the gathering on the important and timely subject of the "Big Bend Irrigation Project."

Seattle Section—

The regular meeting of the Seattle section was held at 8 p.m. Tuesday, Jan. 21, 1919. Capt. Norwood W. Brockett, Captain of Artillery, as speaker of the occasion discussed the subject, "My Experiences in France During the Last Year of the War." At the business meeting which preceded the talk, matters of business for the coming year were taken up.

Joint Meeting in Portland

At the recent joint meeting of Portland sections of the A. I. E. E. and N. E. L. A. W. C. Morgan, Ph.D., head of the Department of Chemistry, Reed College, lectured on the "Chemistry of the War." Following the announcement in the last issue of the Journal of Electricity, a brief report of his talk is here given:

He outlined the various uses of nitrogen, comparing it to a soldier who dreads to go over the "top" but when he does he goes to win, it being the same way with nitrogen, as it is a very passive element but when in combination the most active and destructive known.

A poison gas shell is 25 times more effective than ordinary shrapnel. Some of the compounds of nitrogen and chloroform were the most destructive, as the victim could not detect them until after he had been gassed several hours or days. Both nitrogen and chloroform are life-giving and pain destroyers when not in combination.

The nitric acid plants can now make fertilizer, as the world needs additional fertilizer. Before this date the United States had added no fertilizer to its total, trying only to conserve what it had.

The Synchronous Club

The Los Angeles Synchronous Club held a regular meeting at "Ye Adobe Inn" on Jan. 14, 1919, at which G. G. Gillingham discussed the subject of submarine cables and what the Germans tried to do to them. The question of the meeting date and its possible transference to the second Tuesday of each month was discussed.

Reconstruction Convention Resolutions

The activities of the Oregon State Reconstruction Convention, held in Portland January 9-10-11, are well exemplified in the following digest of a few of its resolutions. In all, about thirty resolutions were approved, the majority being primarily aimed to stimulate and create public and private work to aid in relieving the coming employment crisis.

Resolution 2. To create an Oregon Reconstruction Committee, with the duty of formulating and prosecuting plans to meet the economic issues confronting the people during the transition period from war activities to peace industries. Said committee to consist of three members from each of the following organizations: State Chamber of Commerce, Grange, Federation of Women's Clubs, Industrial Association of Oregon, Oregon

Irrigation Congress, Lumber Manufacturers' Association, Oregon Bar Association, State Farmers' Cooperative Association and the Fraternal Cooperative Insurance Societies.

Resolution 10. Urging the governments of the state and each county and city to formulate plans to provide ways and means to carry on public works to provide maximum employment. Also recommending each county to conduct a census of unemployment, present and prospective. Also to notify the director of the U. S. Employment Service in Portland the result of the census, and to indicate number of men needed for contemplated work.

Resolution 12. Urging corporations and persons who plan building during the coming spring and summer to devise plans to begin such work without unnecessary delay, to furnish employment.

Resolution 15. That it be the sense of the convention that the credit of the state be used to the extent of \$5,000,000 a year, during a period of ten years, that amount to be duplicated by the Federal Government, if possible, for the financing of projects of reclaiming arid, swamp, overflowed and logged-off lands, to aid returned soldiers in establishing homes. Also for financing projects for public work essential to land development, including roads, water-power and transportation. Urging state legislature to draft proper bill covering the subject.

Resolution 17. Endorsing the Sinnott bill, appropriating one billion dollars for reclamation and drainage. Favoring Federal aid for developing the Deschutes project and urging the legislature to take steps to fully complete the Tumalo project.

Resolution 19. Recommending to the educational institutions of the state the establishment of educational courses in "highway transport engineering," as recommended by the Council of National Defense.

Resolution 21. Urging that all needy and feasible improvements such as sewers, parks, water works, playgrounds and street improvements be expedited to provide employment, and that all cities and municipalities forward work for which bond issues have already been issued.

Resolution 22. Resolving that similar state conventions be held annually, and urging the Governor to arrange for such a convention to be held early in 1920.

Resolution 23. Requesting the state legislature to submit to the people an amendment to our State Rural Credit Act, providing for the creation of ready-made farms on the Australian and Californian plan. Also urging adoption of constitutional amendment authorizing the levy of graduated land tax, bearing heavily upon uncultivated, arable lands.

Resolution 25. Requesting legislature to enact legislation to enable state, counties and municipalities to develop unused water-power.

HAPPENINGS IN THE INDUSTRY

POWER BONDS AUTHORIZED

The application of the Southern California Edison Company for authority to issue \$16,000,000 of new securities, which was filed with the Railroad Commission recently, was granted. The Commission's order authorizes the company to issue \$8,000,000 of twenty-five-year 6 per cent general and refunding mortgage bonds to take up a like amount of short time bonds maturing July 1, next. Also to issue \$8,000,000 serial 7 per cent debentures, maturing in from one to ten years, to meet bills payable amounting to \$6,078,592.98, representing construction work. The bonds are to be sold at not less than 93% and accrued interest.

PURCHASE OF LOWER CALIFORNIA

Considerable interest is being taken in the purchase of Lower California by the United States. The project has been proposed and discussed in Congress and favorably acted upon by the legislatures of several of the western states. Its purpose is to remove the difficulties arising from the international character of the Colorado river at its mouth and the continual necessity for treaties and uncertain agreements in developing and protecting the southwest region from the vagaries of the river. The power project planned by the Yuma irrigation project and the Imperial Irrigation District in conjunction now faces the necessity of carrying its canal and development features into Mexico with the consequent treaty guarantees and uncertainties—and the electrical as well as irrigation interests of this region in consequence watch the progress of the present discussion with considerable interest.

PROPOSED TRAMWAY SYSTEM FOR POOTUNG

The Chinese press reports the flotation of a tramway company to operate at Pootung. The capital of the company is said to be \$10,000,000 Mexican (approximately \$8,700,000), and the venture is being floated under the auspices of an Anhui millionaire.

The proposed main line will be between Tung Ka Doo and Chuan Sha, a distance of 40 to 50 li (a li is about a third of a mile). It is expected that the proposed line will be of great assistance to the fish merchants in particular and the working people in general. Fish caught in the villages along the coast take a whole night to reach the market in Chuan Sha, and it is expected that the operation of the trams will reduce this time to two hours. Special cars will be constructed to meet the requirements of the fish trade.

Mr. Chow, formerly of the Chinese Tramway Company of Nantano, has been appointed chief engineer, and the plant and machinery will be purchased in the United States.

LICENSING OF ENGINEERS IN JAPAN

According to a law passed seven years ago, electrical engineers are required to hold a government license before attaining the grade of chief engineer. Chief engineers are classified into six grades, mainly according to the voltage of

the systems they are to serve. With the exception of graduates from the electrical department of engineering colleges of recognized standing, an examination is required from all applicants. This is held annually and consists of both written and oral tests for the high grades, and a written test alone for the lower. The sixth grade is granted without examination to competent electricians.

SMELTERS STEEL COMPANY

The Smelters Steel Company, Henry Building, Seattle, is constructing a plant on the Commercial Waterway for smelting iron ore from its mines in British Columbia. It is to install four electric furnaces, capable of producing 30 tons of high grade gray iron per day. Furnaces are to be of the arc type with one electrode to each furnace. The ore is an iron oxide and the company has the necessary flux for its purpose near the mine. Equipment has been purchased. G. Lewis Casey is designer of the process and president of the company.

INTERNATIONAL ELECTRIC CORPORATION

With a view to taking advantage of trade opportunities presented by the close of the war, The General Electric Company has formed an export corporation, all of whose stock will be held by the parent company. The probable name of the new corporation will be the International General Electric Corporation. The president of the new corporation will be Gerard Swope who, since January 1, 1913, has been vice-president of the Western Electric Company. Charles Neave of the firm of Fish, Richardson & Neave will be chairman of the board of the export corporation, and M. A. Oudin, foreign manager of the General Electric Company, will be vice-president. All General Electric's foreign interests will be handled by the new organization. Its design will be to stimulate the sale of American-manufactured electrical apparatus throughout the world.

FOREIGN TRADE COURSE

The University of California announces that an Extension course, consisting of fifteen lectures, in the fundamentals of Foreign Trade, started Friday, January 24, at 8 p.m. in Room 237, Merchants Exchange Building, San Francisco. The course is conducted for the benefit of men and women who are interested in foreign trade—especially for those who are engaged during the day in commercial vocations. It covers all the important topics under export trade:—The Analyzing of the World's Markets, Grouping of the World's Markets according to established Trade Routes, Export Policies, International Banking, Marine Insurance, Organization of the Export Office, Collection of Mailing Lists, Advertising and Mail Campaigns, Market Investigations, Selection of and Reports on Agents, Sales and Agency Contracts to the final Execution of an Export Order.

Mr. Herman Virde, who is conducting the course, has

given his life to the study of foreign trade—first as college student; then as commercial attache, traveling salesman, and secretary to the Swedish Commission at the P.-P. I. E. Exposition; and last as branch manager for a large exporting house.

SAFETY FIRST COMMENDED

The safety first organization at the Grant Smith-Porter shipyard of Portland, Ore., has won the title of being the best equipped yard with safety appliances in the United States and the best organized of any. At the outset 40 men are selected from among the employes, and each given a badge with the impress of the seal of the company. These 40 men train for two months and after examination those who pass are presented with a diploma which admits them to a higher degree. Those who fail are kept on the job until they do pass. The committee of 40 workmen meets every week in conjunction with the regular safety first engineers. Foremen, numbering 200, have an organization, acting as a head for the workmen's committee, which is an auxiliary committee, members of which become upon examination honorary members of the foremen's organization, and the Grant Smith-Porter safety first organization. There are three grand divisions—workingmen, foremen, and safety first engineers.

The idea of this particular character of organization by which every man in time becomes schooled in safety first rules and practice, originated with the management of the Grant Smith-Porter yard. The idea has been adopted in all the leading yards in the United States, according to the Emergency Fleet News.

Results of the efficient work of the general organization are shown in the following statistics in regard to the number of accidents: Last July accidents totaled 117, August 96, September 87, October 72, November 35, December 17. During the last two weeks in December there were no accidents of any description. Upon this showing the State Accident Industrial Commission reduced the company's rate 10%.

BUSINESS OPPORTUNITIES IN AERONAUTICS

A committee to cooperate with the Aerial League of America in the advancement of the science of aeronautics has been named by President Benj. Ide Wheeler of the University of California. The league, in asking that a University committee be named, stated that, "Through the tremendous strides forward of aeronautics there are wonderful possibilities for the employment of ingenuity, genius and skill, and business opportunities as great as ever have been created by progress in important lines of human endeavor." It is in order that university men and women may be in touch with such opportunities that the committee was named. The members of the committee are: Professor B. M. Woods, chairman, and Professors J. N. Le Conte, Edmund O'Neill, F. S. Foote, Jr., G. D. Louderback, E. E. Hall, M. E. Haskell, T. M. Putnam, R. T. Crawford, R. F. Raber, N. B. Drury, Dr. L. T. Jones and Mr. Leonard Bacon.

INDUSTRIAL ACCIDENT COMMISSION'S REPORT

The outstanding feature of the report of the Industrial Accident Commission for the fiscal year ending June 30, 1918, is that there were 31 fewer industrial deaths in California during 1917 than there were in 1916. In 1916 the deaths reported totaled 657, and in 1917 the total was 626. In view of the larger number of employes in 1917, and the impetus given to hazardous employment as a result of war activities, the reduction in California's industrial deaths is gratifying.

Expansion has marked the efforts of the Safety Department during the last fiscal year. Inspections to the number of 1,289 were made by the Department's engineers and inspectors, in which plants 79,117 employes were employed. In addition, 1,670 elevators were inspected, 841 boilers and 362 air tanks.

To assist in reducing the number of injuries in the lum-

ber industry, there was produced a motion picture entitled "Preventable Accidents in the Lumber Industry." This picture was made possible by the support and contributions of the California Redwood Association and the California White and Sugar Pine Manufacturers' Association.

Illustrated "Safety First" lectures have been delivered by members of the staff before various organizations throughout the state.

Public hearings were held in San Francisco and Los Angeles to consider General Construction Safety Orders. These orders became effective on January 15, 1918. Committees of employers, employees and others interested were appointed to prepare safety orders for electrical stations, steam shovels and locomotive cranes, and for foundry operations.

An electrically operated gold dredge has been added to the Safety Museum at 529 Market street, San Francisco. The museum now occupies about 3,000 square feet of floor space and contains hundreds of exhibits.

INCREASE IN COPPER PRODUCTION

The production of copper in the United States in 1918 was slightly larger than in 1917, according to preliminary figures and estimates collected by B. S. Butler, of the U. S. Geological Survey, Department of the Interior, from all plants that make blister copper from domestic ores or that produce refined copper. At an average price of about 24.75 cents a pound, the output for 1918 has a value of \$473,000,000, as against values of \$510,000,000 for 1917 and \$190,000,000 for 1913.

The figures show that the smelter production from domestic ores represents the actual output of most of the companies for the first 11 months of the year and the estimated output for December. A few companies gave no figures for November, but furnished estimates of the combined output of November and December. The production of blister and Lake copper from domestic ores was 1,910,000,000 pounds in 1918, against 1,886,000,000 pounds in 1917 and 1,224,000,000 pounds in 1913.

The supply of refined copper (electrolytic, Lake, casting, and pig) from primary sources, domestic and foreign, for 1918 is estimated at 2,450,000,000 pounds, as compared with 2,362,000,000 pounds for 1917 and 1,615,000,000 pounds for 1913.

According to the Bureau of Foreign and Domestic Commerce, the imports of copper in all forms for the first eleven months of 1918 amounted to 535,868,000 pounds, against 556,000,000 pounds for the 12 months of 1917.

The exports of pigs, ingots, bars, plates, sheets, rods, wire, and like copper products for the first 11 months of 1918, as determined by the same bureau, amounted to 692,759,000 pounds; the exports for the 12 months of 1917 were 1,126,082,000 pounds.

At the beginning of 1918 about 114,000,000 pounds of refined copper was in stock in the United States. Adding this quantity to the refinery output of the year shows that the total available supply of refined copper was about 2,564,000,000 pounds. Subtracting from this total the exports for the first 11 months and the estimated exports for the last month shows, on the assumption that there was no change in stocks, that the supply available for domestic consumption in 1918 was considerably more than the 1,316,000,000 pounds available in 1917.

THE EMPLOYMENT SITUATION

Tables have been prepared by the Statistical Section of the U. S. Employment Service showing requests for help from employers as compared with registrations with the Service for jobs for the thirteen weeks ending November 30th, which indicate a general decline in the demand for labor throughout the United States. In a number of sections this decline began early in September; in others there was an

increasing demand up to the middle of October, immediately followed by a sharp decline.

In the middle West the fluctuation is not nearly so great, although in most of the states there is the same steady decline of shortages which existed in September. In Michigan there was a steady increase in shortage until the week ending October 5th, when the demand exceeded the registration by 2.1 to 1. From then on there was a steady decline until the week ending November 30th, when there was a surplus of labor of 1.3 to 1. For the week ending October 26th, Illinois showed some excess in demand over registration, followed by a sharp decline to November 30th. Indiana shows a slight but fairly steady shortage. Idaho, Iowa and Montana all show a steady decline. Nevada reported a shortage of about 6 demands to 1 registration for the week ending October 12th, which declined to 3.58 to 1 for the week ending November 30th. New Mexico was fairly steady with a slight shortage. Nebraska reported demands exceeding registration by about 10 to 1 for the week of September 21st, which declined to 1.29 demands to 1 registration.

On the Pacific Coast: California reports a steady decline up to November 30th, when the supply about equaled the demand. Washington was fairly steady with a slight shortage, while Oregon declined from an excess of demand over registration of about 6 to 1 to an excess in demand of 1.24 to 1.

PICTURES OF ACTIVITIES WANTED IN CHINA

E. G. Babbitt of the Bureau of Foreign and Domestic Commerce, Room 307 Custom House, San Francisco, announces that he has been advised by P. H. Whitham, Trade Commissioner, Peking, that he is anxious to procure pictures relating to western activities such as large buildings, railway terminals, shipbuilding plants, etc. It is claimed the Chinese are particularly interested in and influenced by large undertakings and Mr. Whitham proposes to use these pictures throughout the interior.

RENEWED ACTIVITIES IN GAS AND ELECTRIC INDUSTRIES

BY WILLIAM H. CLARKE

Manager of the Bond Department, H. M. Byllesby & Company

We can again look forward to renewed development of the electric and gas industries, because equipment and apparatus of all kinds should soon be more easily obtainable, as national interests permit the release of manufacturing capacity from government work to ordinary pursuits. The importance of efficient and continuous gas and electric service has been emphasized by war time necessities. For nearly two years utilities have uniformly restricted their requests for equipment and capital, and limited the extension of their business during this period of stress to industries engaged in government work. As a result much of the ordinary and regular development or extension work of utilities during 1917 and 1918 has been postponed and this accumulation will require immediate construction as fast as material and labor become available.

The participation of local capital in the stock and bond issues of utilities has been growing rapidly, and as gas and electric companies further demonstrate their resourcefulness under all conditions, it may be expected that millions of people who have made their first purchases in public securities during the past two years will look to their local utilities as a safe and profitable medium for their investment funds. This mutualization of ownership, or whatever term is applied to the practice of customers taking a financial interest in public service companies of all kinds, develops a true community interest and will have a tremendous effect in successfully thwarting what seem to be dangerous tendencies toward destructive socialism in this country.

TRADE NOTES

Western Representative —

The American Ironing Machine Company of Chicago, Ill., of which H. R. Basford is the Pacific Coast representative, is making arrangements to establish a western warehouse in San Francisco, all goods for the Pacific Coast hereafter being shipped from there. The San Francisco branch is now located at 431 Sutter street, with another branch office at 340—13th street, Oakland, Cal.

New Business —

The Machine Tool Department of A. H. Cox & Company, 307 First avenue South, Seattle, reports much activity. Among recent orders was one placed with the J. F. Standifer Construction Corporation at Vancouver, Washington, for planers and lathes, and another with the Brecker-Brainard Milling Machinery Company of Cordova, Alaska.

Change of Address —

The Manhattan Electrical Supply Company, Inc., E. M. Haig, factory representative, formerly at 604 Mission street, San Francisco, is now located at 1629 Harvard avenue, Seattle.

Spokane Company —

The Universal Electric Company has been incorporated and has opened offices at N. 230 Post street, Spokane. Carl F. Udhen, A. E. Russel and G. W. Crowder are the incorporators. The incorporation is for \$10,000 and is for the purpose of dealing in electrical supplies and equipment.

New Offices —

F. W. Rust & Company, electrical contractors and engineers, have opened offices at 26 Seattle National Bank Bldg., Seattle. Forest W. Rust, the manager, has been engaged in electrical contracting in Seattle for the past six years. The company has secured the contract for electric lighting and power installation in the new factory for the Curran-Gheen Shoe Manufacturing Company at 2415 Western avenue, also all the electrical work on the post office substation K at the King street station.

Change of Ownership —

E. B. McKinley of Paso Robles, Cal., has resigned his position with the Midland Counties Public Service Company to go into business for himself. He has bought out W. V. Fisk's electric shop in San Luis and will move there to take charge of his business.

A New Organization —

The Porterville Electric Company announces that they are opening in business in Porterville, Cal., and will occupy a store room in the Williams Building. W. C. Little is interested in the concern.

Enlarged Plant —

Ward Brothers of Molson, Washington, have enlarged their electric light and power plant by installing an auxiliary generator and a new oil engine in addition to the steam power equipment already in operation.

Changes Hands —

In accordance with permission recently given by the Railroad Commission, the H. G. Lacey Company of Hanford, Cal., passes out of existence, and the Mt. Whitney Power & Electric Company assumes absolute control of the light and power service for so many years in the hands of the Lacey Company. It is hoped by this reorganization to effect economies which will enable the company to better serve the public. Improvements are contemplated as soon as the necessary financial arrangements can be made, that will strengthen the service of existing lines, rather than any extension of those lines at present.

Sales Conference —

The Montana Electric Company of Butte and Great Falls, Mont., and the Washington Electric Supply Company of Spokane, will hold their semi-annual sales conference at

the latter place February 6, 7 and 8th. Manufacturers whose product is distributed by the associated companies will be in attendance and an extremely profitable session is anticipated.

Personal Items —

H. N. Lauritzen has been appointed Pacific Coast manager of the Duplex Lighting Works of General Electric Company, which is introducing the Duplexlite, a new lighting fixture which, through the use of silk shades, combines all the advantages of both direct and indirect lighting. Mr. Lauritzen has been well and favorably known to Pacific Coast electrical and lighting men for many years, first as the Pacific Coast manager of the Holophane Company and later as special representative of this company with the Pacific States



Electric Company. Consequently he is assured a most successful business with this new affiliation.

C. M. Lindsay, formerly sales manager, Hotpoint Division, has been appointed as manager of the new Sales Promotion and Advertising Department of the Edison Electric Appliance Company, Inc., with headquarters in Chicago. This department has been inaugurated by the company for the sole purpose of building up its sales service with its customers to the point of highest possible development. Mr. Lindsay is well known in the West as his former home before going to Chicago was in Ontario, California. His appointment in this capacity is an especially fortunate one, since his long service and experience with the Hotpoint Company, particularly fits him for this position, and also his host of friends throughout the industry will welcome the continuance of his former pleasant association in this broader field of co-operation.

Walter M. Fagan has been appointed sales manager of the Hotpoint Division, Edison Electric Appliance Company, Inc., with headquarters at the general office of the company, 5660 West Taylor street, Chicago.

Cecil Johnston, special representative of the commercial department of the Hotpoint Division of the Edison Electric Appliance Company, spent some days in San Francisco recently on business connected with his company.

THE OLDEST MINING JOURNAL ON THE AMERICAN CONTINENT

In choosing from the many lines of accomplishment those subjects to include in the serial entitled "Builders of the West" which has been appearing in the columns of the Journal of Electricity during the past two years, it soon became apparent that in addition to the builders of material accomplishment, there is another constructive effort at work—not visible to the eye—which has perhaps been even a greater force in bringing about the remarkable engineering achievement of this section. This intangible force may be expressed in words as the spirit of the West—and in the molding of this spirit of constructive effort certain publications in the West have undoubtedly performed a lasting and enduring work. Among this class of builders may be mentioned the Mining and Scientific Press.

On May 24, 1860, the Mining and Scientific Press was founded at San Francisco and is therefore the oldest mining paper on the American continent. The first publishers of the Scientific Press were Winslow & Company, a firm whose active representative was J. Silversmith. He was succeeded in 1862 by W. B. Ewer and C. W. M. Smith, who in turn gave place, December 14, 1863, to Dewey & Company. Thus Alfred T. Dewey became identified with the Mining and Scientific Press, the addition to the name being significant. For thirty

years he directed affairs. In June, 1893, J. F. Halloran bought control and retained it until December, 1905, when he sold his interest to T. A. Rickard, who also became editor.

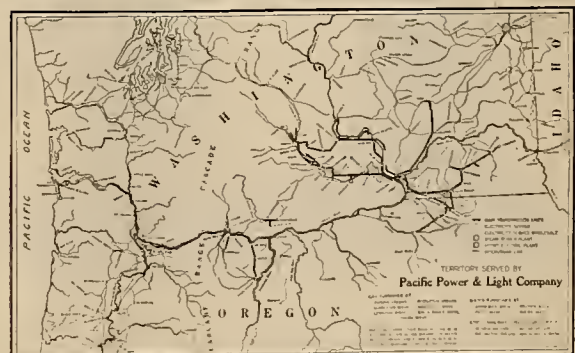
Almon D. Hodges, Jr., who was editor from 1869 to 1871, is now an honored citizen of Boston; Charles G. Yale, who edited the paper from 1871 to 1893, is statistician to the U. S. Geological Survey in San Francisco; and W. H. Storms, since deceased, was in charge between 1897 and 1905. During shorter intervals Dr. Henry De Groot, E. B. Piper, J. D. McGillivray, Clarence S. King and R. L. Dunn served in an editorial capacity. During his management Mr. Halloran also served as editor of the magazine.

Time was when this paper looked only to local support and concerned itself only with local industry. During J. F. Halloran's regime the field of usefulness was enlarged so as to cover the Rocky Mountain region and since he yielded control in December, 1905, the scope of the paper has been further enlarged so as to cover metal mining throughout the world.

The present editor, T. A. Rickard, to whom this issue of the Journal of Electricity is dedicated as a "Builder of the West," comes from a family long known to the West. His grandfather, James Rickard, was a Cornishman who was retained by John Taylor and Sons, one of the oldest and best-known firms of mining engineers in London, to make an examination of the Mariposa Grant in California, which was at that time owned by Gen. John C. Fremont. Mr. James Rickard therefore proceeded to California via the Isthmus route in 1850, and brought with him a 10 stamp mill manufactured in Cornwall. This, it is believed, was the first 10 stamp mill ever erected in this state, or elsewhere in this country. After an exhaustive examination of the Mariposa Grant he finally, after six months, turned it down and went back to Europe, locating in France where he was engineer for some years of one of France's copper properties. Reuben Rickard, brother of James, was the first president of the city council of Berkeley, California.

Nothing is alien to the Mining and Scientific Press that concerns the miner. The name lays emphasis on the mining and then on the scientific aspects of the great search for minerals. The paper was started when mining meant digging holes in the ground, and it has lived to see the application of modern science in every department of a world-wide industry. In 1906 a motto was adopted: "Science has no enemy save the ignorant." It may also be said: Mining has no friend like Science.

In bringing science to the every-day aid of the miner, it has been the privilege of technical journalism to be the agent of transmission, to be the bearer of the knowledge that gives light underground, and to carry the tools that give a tenfold strength to the hand of man. This has been the mission of the Mining and Scientific Press for fifty-nine years; this will be its mission in the years to come.



TWO NORTHWESTERN BOND ISSUES

The map here shown accompanied an announcement of a \$350,000 bond issue of the Pacific Power & Light Company, being put on the market by the Lumbermen's Trust Company. The same company is handling \$400,000 worth of bonds for the Washington Water Power Company for which it has issued a similar bulletin.

LATEST IN EVERYTHING ELECTRICAL

(A disconnecting switch built for heavy service with a positive lock which does not permit the switch to spring open under electrical expulsion forces, an electrically operated gas meter which would form a very desirable load for a central station and a storage electric water heater and the arguments in its favor are included among the new devices recently presented to the trade.—The Editor.)

MERCURY VAPOR LAMPS FOR AUTOMOBILE-PART PHOTOGRAPHY

A complete and accurate catalogue of parts is one of the necessities for every automobile manufacturer. Every detail must be illustrated, either separately or assembled with



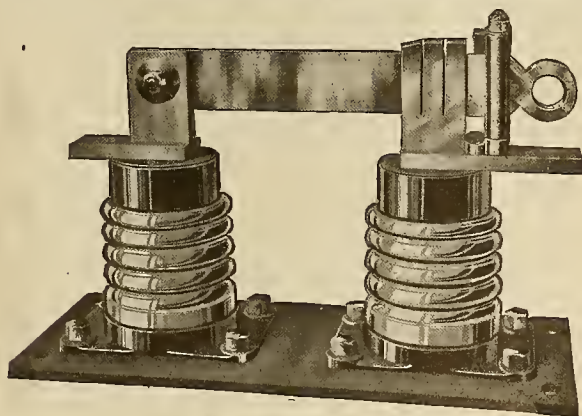
Photographing automobile parts

others into one of the parts of the car. A unique method of taking the photographs necessary for these catalogues has been worked out by the Willys-Overland Company. In their photographic department at Toledo is an elevated platform under which can be placed a large flat wooden table. On this are arranged various items each with its appropriate title and number, printed on a card, laid beside it. The boundary of the photograph is marked by black wooden strips. Through a hole in the platform the photographer focuses his camera upon the display below. Light is furnished by four Cooper-Hewitt mercury vapor tubes, hung underneath the platform. Due to the highly actinic quality of the mercury vapor light, the exposure is much shorter than with other illuminants having the same apparent brilliancy.

The great advantage of this device is that it enables the various parts to be associated with descriptive text, or explanations of the workings of complex apparatus. Much greater speed can be made in getting out instructions, since only the photograph need be taken.

"FRANKLIN" DISCONNECTING SWITCHES

Franklin disconnecting switches are designed to meet the most exacting operating conditions. They are rated on the basis of 1000 amperes per square inch. The base blocks are carefully milled, with clips sweated and pinned and



Disconnecting switch for heavy use

blades are thoroughly ground into the contact clips. Hinges are provided with bronze spring washers which take up wear and make adjustment unnecessary.

The switches are mounted on standard Franklin insulators, of light, heavy or extra heavy duty design as the service demands.

The Franklin positive lock is incorporated in the disconnecting switch. The switch blade is held closed by two rugged brass jaws which provide accurately machined bearings top and bottom and a perfect housing and protection for the bronze springs. A lug projects inwardly toward the blade from each jaw casting.

Each jaw is mounted on a rigidly supported upright steel post upon which it may be rotated. A cap-nut at the top of each post keeps the jaw in place.

The pulling ring is pivoted upon the switch blade and includes the cams as shown.

It should be noted that the switch blade is held closed because the jaw forms a closed bridge above it which cannot be broken by electrical expulsion forces. In fact, the jaws are so located that the direction of the resultant electric forces is in a line which tends to hold the bridge more tightly closed.

To open the switch, one pull of a hook in the ring rotates the cams against the lugs which project inwardly from the jaw castings. The jaws are thereby rotated against the springs, and the bridge above the blade is opened so that the blade may be withdrawn.

A single action of the hook closes the switch by pushing the blade down past the jaws, which are beveled at the top so that the blade passes easily. When the blade is entirely closed, the springs return the jaws with a strong, vigorous snap. The hook may then be withdrawn with absolute assurance that the switch is positively locked to stay locked.

ELECTRICALLY OPERATED GAS METER

The Laclede Gas Light Company in St. Louis have recently installed a 750,000 cubic feet per hour Thomas meter to measure the total gas manufactured in their station "A." This installation is rather interesting because of the assistance it gives in the operation of the plant and the small space it occupies compared to the equipment it replaced. This meter replaces four large wet drum meters,—part of one of which is shown in the accompanying illustration, which also shows the Thomas meter housing. This housing is located in the pipe line between the purifiers and the storage holder and is known as a "make" meter.

The Thomas meter is different from all other forms of gas measuring devices, in that it records the cubic feet of gas per hour in the standard units of 30 inches of mercury and 60 degrees of Fahr., without any corrections for pressure and temperature. Further, it records this measure on a graphic chart which shows the amount and variation of the gas flow, and on an integrating instrument which shows the total gas during any given period.

The direct measurement of the gas in standard units is accomplished by warming it just two degrees with an electric heater as it flows through the meter, and measuring accurately the quantity of electricity required to do this warming. If just enough heat is introduced into the flowing stream of gas to warm it two degrees, a measure of this quantity of heat constitutes a measure of the rate of flow of gas in standard cubic feet regardless of the existing pressure, temperature, or volume of the gas. The necessary heat is furnished by an electric heater coil and the amount of current necessary to raise the gas two degrees is regulated by two electrical thermometers. In the accompanying illustrations,

the graphic meter is located on the left-hand side, and the integrating meter on the right-hand side of the instrument panel. These meters record the gas in standard units of 30 inches of mercury and 60 degrees Fahr. The entire equip-

ment was furnished and its installation supervised by The Cutler-Hammer Manufacturing Company of Milwaukee.

The Thomas meter is a very desirable load for any central station company. The meters may be operated either on direct or alternating current at 110 or 220 volts and the alternating current may be either 25 or 60 cycle single phase. Under normal operating conditions the load will be at practically unity power factor and with a load factor close to 100 per cent.

THE A. & F. ELECTRIC WATER HEATER

The storage system of hot water heating, while of comparatively recent use in this country, has been successfully operated in Europe for the past 15 years. It is ideal in that

it maintains an ever available supply of hot water for the householder and it represents a continuous load for the central station. The demand is quite low, in actual practice 600 to 1000 watts, and being always in use, it provides the highest possible load factor, namely 100%.

This storage or 24 hour system so far is only practical where the power company will offer a flat rate. This is actually figured at from \$2 to \$5 per month per kilowatt. It is customary to install the heater on a double-throw switch in connection with a range so that they are not both on the line at the same time. The law maximum demand means no extra transformer and copper cost and the water is always hot and ready for service.

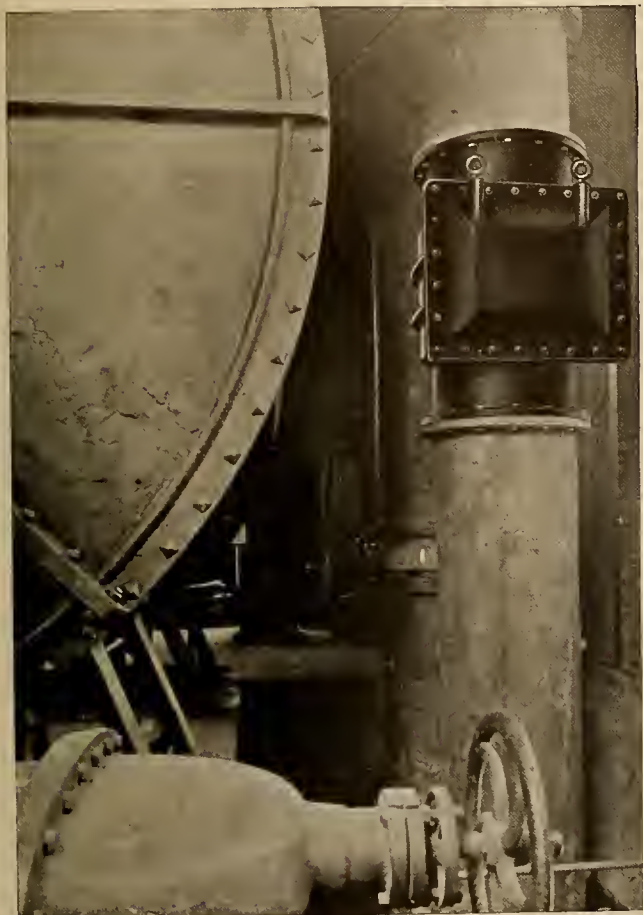
Central stations aggressively pushing ranges often overlook the fact that the hot water heating feature is nearly always involved in the range sale and it is difficult to understand why a lot of them will advise the customer to buy a coal or gas heater and lose this additional revenue and the splendid annual load factor the plant will have

with water heating added.

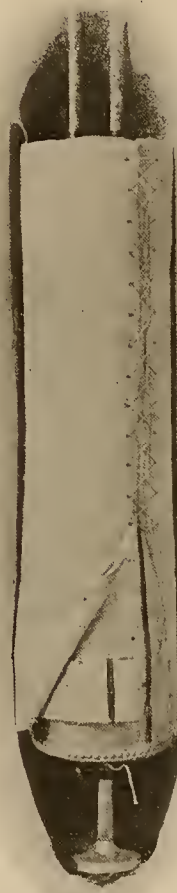
The central station men should realize that this water heater operates over a large area, which is practically 200 square inches. It is ready to apply and there is no padding or cementing necessary and no plumbing to be done. It can be applied with the tools carried by any wireman.

Of course the tank should in all cases be heat insulated. Electrical water heating is grossly insufficient otherwise and should never be installed without a lagged tank, although some central stations using a 1000 watt heater claim to use the bare tank successfully.

The efficiency of a 600 watt A. & F. heater with 1 inch hair felt covering on the tank is approximately 85%. Without the lagging it is about 50%, which means that with a non-insulated tank about 215 watts will be steadily wasted and with a 1000 watt heater 360 watts. Reduced to terms of dollars and cents, on a 1c per kw. hour rate, this is \$1.54 and \$2.58 per month respectively.



Thomas meter housing in pipe line



A storage water heater



Regulating panel (shown above) with recording panel with graphic and totalizing meters below

BOOKS AND BULLETINS

Annual Reports

The annual report of the chief of the Bureau of Foreign and Domestic Commerce discusses the general conditions of import and export trade, foreign trade-marks, the use of motion pictures to stimulate trade, education along trade lines, and the work and plans of the various divisions of the Bureau's work. The importance of this Bureau's activities can hardly be exaggerated and that they are being made use of to a greater and gratifying extent is clearly pointed out in this report.

The Director of Standards' annual report for the year ended June 30, 1918, is now in published form. The functions of the Bureau and the scope of its work are briefly summarized in an insert and then the work of the past year and plans for the future are discussed at some length. Work in electro-chemistry and electricity proper has furnished considerable material for tests and published reports which are here briefly summarized.

Seattle Light Department Report

The total cost of operating and maintaining the Seattle light department for 1918 is estimated at \$1,223,527.35; revenue at \$1,641,402.81, and net surplus at \$417,875.46, in a lengthy report on comparative cost data of electric energy from 1910 to 1917 inclusive, which has just been placed in the hands of the mayor and city council. The report covers every detail of cost data of the department for the years mentioned and is supplemented by a report on the expenses and net surplus of the department for the first six months of 1918 and estimated expenses of operation and maintenance and the net surplus for the year 1918.

The operation and maintenance for 1918 exclusive of fuel oil is given as \$585,764.64; fuel oil \$302,695.75; total estimated operation and maintenance expense, \$888,460.39, to which is added: Depreciation, \$209,258.64, and interest, \$125,808.32. Total estimated cost of department, \$1,223,527.35; total estimated revenues, \$1,641,402.81, and total net surplus, \$417,875.46.

The estimate for 1919 is given as follows:

Operation and maintenance, except fuel oil.....	\$ 593,619.50
Fuel oil	570,000.00
Total.....	\$1,163,619.50
Depreciation	217,000.00
Total.....	\$1,380,619.50
Interest	145,808.32
Total Cost.....	\$1,525,927.82
Revenues	\$2,140,000.00
Net surplus	\$ 614,072.18

Toluol Recovery

This paper gives a description of toluol plant construction and operation, a discussion of the various results which can be obtained, and a brief outline of the cost of carrying out this recovery. A discussion of the relation of toluol recovery to standards for gas service is also given. Typical forms of contracts which the Ordnance Department has used in contracting for the construction and operation of government owned toluol recovery plants in connection with city gas works are also given.

A Bureau of Mines Bulletin

The Bureau of Mines, Department of the Interior, announces the publication of Bulletin 170, "Extinguishing and Preventing Oil and Gas Fires," by C. P. Bowie, petroleum engineer.

In part this publication covers oil fires during the period of ten years from January 1, 1908, to January 1, 1918. During this time approximately 12,850,000 barrels of oil and 5,024,506,000 cubic feet of gas were destroyed by fire in the

United States, entailing a total estimated property loss of \$25,254,200. During this period 503 fires were reported, of which 310 were caused by lightning and 193 by other causes.

For the past three years Mr. Bowie has been conducting investigations to determine the nature and specific causes of these fires, with a view to suggesting means whereby they may be successfully combated and in some cases perhaps entirely eliminated.

As the subject of oil and gas fires is necessarily a broad one no attempt is made in this bulletin to treat it exhaustively. Rather, the bulletin aims to point out what has been done by operators in the past and to describe various fire-prevention methods and fire-fighting apparatus which are being used or adopted by many of the larger oil companies. These methods and apparatus, it is believed, if uniformly employed by operators, will largely decrease the present enormous annual fire losses.

A complete description is given of the frothy mixture system for extinguishing tank fires, which includes detailed plans used on typical installations and photographs showing the construction and, as far as possible, operation of these plants after completion. Formulae for the chemical solutions used are given as well as instructions for their preparation. The author includes a thorough discussion of the advantages and disadvantages of the method.

Through the bulletin Mr. Bowie has confined his discussion to actual fires and extinguishing methods that have proved successful. Having a wide personal experience in the construction of pipe lines, pump stations, and fire-fighting equipment prior to his association with the Bureau of Mines, he is well equipped to cover the subject from all angles. This fact is borne out by the emphasis given in his bulletin to those details of fire fighting and prevention apparatus so easily overlooked in ordinary construction work and which, if not properly designed and cared for, may prevent the entire installation from functioning at a critical moment.

In the closing chapter miscellaneous fire hazards and preventions are covered in a brief and comprehensive statement, emphasizing clearly and emphatically those practices which are dangerous in construction and operation of garages, refineries and around oil wells, as well as how they may be avoided.

Public Utility Rate Fixing

by C. E. Grunsky. Comments on current problems pertaining to public utilities and to rate fixing. Size 6 by 8½ in.; 169 pp.; 8 illustrations, including diagrams; cloth binding. Published by the Technical Publishing Company and for sale at the Technical Book Shop, 171-3 Second St., San Francisco. Price \$2.50.

There has long been a deep-felt want for a simple yet comprehensive discussion of many of the current problems that prove perplexing in utility affairs—especially in those problems relating to rate fixing. This book discusses the elements deserving special consideration when rates are to be fixed, passes to the appraisal of real estate adapted to special use, and follows by a most helpful treatment of the determination of the value of real estate in eminent domain proceedings. The value of a water-right—a matter of tremendous importance in the West—is then discussed. The concluding chapters of the book are devoted to the subject of arriving at a fair rate return and in the discussion many of the points brought out by the author in the celebrated Spring Valley case are used as illustrations. Of the many books that have appeared on the subject of rate fixing often the subject matter is enlarged in so many complicated technical terms as to make the reasoning difficult to follow. It is believed that this book, speaking the last word on the subject, in that it has been completed by the author since the signing of the armistice, and due to its unusually clear treatment by an authority of such high standing, adds a new acquisition to the book shelf that will prove unusually helpful to the regulating commissions and to the various utility engineers in the readjustment period that now faces the nation.

NEW ELECTRICAL DEVELOPMENTS

(Several bond issues have been successfully floated in the Northwest; demands for electricity for mining and industrial purposes are noted in the Pacific Central region; a sixteen million dollar bond issue has been permitted in the south and various activities in the Inter-mountain district which will mean additional loads for the power companies, all point to the greater prosperities of peace times—and the coming spring.—The Editor.)

THE PACIFIC NORTHWEST

SQUAMISH, B. C.—A hydroelectric plant, it is reported, will be installed in Squamish by the government in connection with other extensive improvements here.

SEATTLE, WASH.—At a meeting of the city utilities and finance committee, it was decided to pass over the veto of the mayor, the ordinance appropriating \$10,000 to be used to complete the Ballard light substation.

SEATTLE, WASH.—A resolution was adopted directing the city comptroller to call for bids to be opened Feb. 15, for \$750,000 light utility bonds of the issue of \$1,755,000 recently authorized by ordinance of the council.

SEATTLE, WASH.—Plans are being prepared for a two-story reinforced concrete transformer house 20 x 50 feet in dimensions for the Skinner & Eddy Corporation at 1041 Railroad avenue. Day labor will be employed in construction.

PORTLAND, ORE.—Sealed bids have been called by the Commission of Public Docks for furnishing materials and wiring for Pier 1, St. Johns Terminal, for light and power and a roadway leading to Pier 1 for light. The right to reject any and all bids is reserved.

SEATTLE, WASH.—The city council has been requested by its special legislative committee to urge in the legislature the passage of a bill which will permit the city to extend its activities outside the city limits, having particularly in view the selling of electric power and water.

ANACORTES, WASH.—All tenders for the waterworks purchase bonds were rejected by the city council, pending further negotiations with the Washington Water Power & Light Company. Further bids may be asked for at any time under the waterworks purchase ordinance.

MARSHFIELD, ORE.—A movement is on foot to unite the cities of Marshfield and North Bend, Oregon, and extend the city limits to include several suburban communities. Coos Bay has been chosen as the name for the enlarged city. This territory is served by the Mountain States Power Company.

SALEM, ORE.—Guaranty of irrigation bonds by the state through the provisions of a constitutional amendment that will give the officials of the state that power, is the plan now being whipped into shape for submission to the legislature and through it to the people by Representative Gallagher of Malheur county.

VANCOUVER, B. C.—Contracts have been awarded to the C. H. E. Williams Company, electrical contractors, for the installation of electrical equipment on twelve 1500-ton and ten 3200-ton schooners under construction by the Northern Construction Company, Ltd. of Vancouver, and the New Westminster Construction & Engineering Company, Ltd.

SALEM, ORE.—Warden Stevens of the state penitentiary states that he has been informed by Franklin T. Griffith, president of the Portland Railway, Light & Power Company, that if it is shown that substantial saving can be made the company will waive the contract which binds the state to secure all of its light and power from the company, thereby permitting the state to install a plant at a cost of about \$3000 for lighting the penitentiary and asylum.

SEATTLE, WASH.—The Rothert Process Steel Company, 622 Harriman street, of which E. H. Rothert is president, makers of high carbon tool steels and high speed tool steels, is installing new equipment designed to bring its plant capacity up to 10 to 15 tons per day. Items in this equip-

ment are: Furnaces, finishing equipment, steam hammer, reheating furnace and annealing furnace. To facilitate operations three transformers of 175 kva. each are being installed.

SEATTLE, WASH.—The city of Seattle won the first court action to put through the \$15,000,000 deal for the purchase of the street railway system of the Puget Sound Traction Light & Power Company. The city was sustained by the Superior Court in the cases of F. A. Twitchell and Chas. E. Horton, taxpayers who attacked the legality of the purchase on the ground that the bonds the city is to issue would become subject to liquidation out of the general fund and therefore on the taxing power.

TACOMA, WASH.—At the conclusion of a conference in which the state public service commission and port district commissioners of King, Snohomish and Pierce counties participated, a tentative bill was drafted to be presented to the state legislature providing for the creation of a public utility district, to handle all freight and passenger traffic at Seattle, Tacoma and Everett. The bill provides for a commission of 9 members, 3 from each county, to handle the work of the terminal district. The consummation of this plan is expected to call for extensive electrification of railway lines in Seattle, Tacoma and Everett.

SEATTLE, WASH.—The Pacific Machine Shop and Manufacturing Company has secured the contract to manufacture and equip the five wooden hull motor vessels which the Patterson MacDonald Shipbuilding Company of this city are building for the Australian Government, with all the electrical auxiliaries, such as anchor, windlasses, cargo winches, capstans and steering gear with electric telemotors, also the generating sets and switch boards to furnish and control power for the auxiliaries, consisting of direct current generators, directly coupled to a crude oil burning engine.

SEATTLE, WASH.—Plans have been completed for finishing the interior of the Seventh avenue and Jefferson street power substation for the Puget Sound Traction Light & Power Company, which was destroyed by fire several weeks ago. The roof is being replaced at present and Stone & Webster will begin at once replacing the first floor and balcony and putting the interior in position to receive the new dynamos and other machinery to be installed. Fire loss to the building was estimated at \$20,666. The loss to machinery has not yet been definitely ascertained.

KLAMATH FALLS, ORE.—A big dam at the head of Link river for the reclamation of 70,000 acres of land in the Wood River Valley, which will be a big factor in making the Upper Klamath Lake better adaptable for logging purposes, will be completed this year, in all probability, according to George Walton, manager of the California-Oregon Power Company. Mr. Walton declares that while the water in the lake will be raised to some extent by the installation of the dam, it will at no time be above the present high water mark, and it will regulate the flow of water to the Copco dam, about 45 miles down the Klamath river.

SPOKANE, WASH.—The citizens of Spokane, Wash., have purchased \$2,000,000 of the \$3,000,000 note issue of the Washington Water Power Company. The issue was placed primarily for refunding notes of practically a similar amount floated a year ago. The notes are secured by the first refunding mortgage bonds of the company which are held as collateral in the amount of \$1200 for each \$1000 in notes.

The notes are payable February 22, 1920, with interest at 7 per cent. It is possible that another issue of \$800,000 may be placed on the market later as that amount will be required to pay for improvements at the Long Lake where an additional installation of 16,500 electric horsepower is being made to provide for the demands of the Chicago, Milwaukee & St. Paul Railway in its electrification of the system from Avery, Idaho, to the Columbia river.

TACOMA, WASH.—The city council has passed without a dissenting vote the ordinance authorizing the purchase of the Lake Cushman power site, the city to pay \$300,000 in utility bonds for 8,000 acres. The utility bonds will be 6 per cent bonds, payable serially in from two to ten years out of light and power funds. According to the present estimate the cost of development will reach \$5,000,000, the work requiring one and a half to two years after the city is ready to begin. The site has been estimated by engineers as capable of producing 75,000 continuous horsepower on a 50 per cent load factor. The transmission line as at present planned, with a span across the Narrows, will be about 40 miles in length. It will take some time to clear up title to all the lands included in the transfer. In the meantime E. C. Wilmann, an auto mechanic in the employ of the Standard Oil Company, has brought suit to prevent the city from signing a contract for the purchase on the ground that the city has no legal authority to make the purchase without submitting the proposition to a vote of the people.

THE PACIFIC CENTRAL DISTRICT

OAKDALE, CAL.—The Oakdale Irrigation District has just completed the survey of a site for a new reservoir to be built at Melones, capable of impounding 100,000 acre feet of water.

EUREKA, CAL.—The Eureka division of Western States Gas & Electric Company is constructing a branch line to supply the electrical energy requirements of the Humboldt Transit Company. This line will be completed within the next week.

SACRAMENTO, CAL.—There was only one bid for supplying the city with electric lamps for the year 1919. This came from the Pacific Gas & Electric Company and is for \$3,600. The bid was referred to Commissioner of Public Works Thomas Coulter.

OAKLAND, CAL.—The Key Route system announced a few days ago that funds had been deposited with the Wells Fargo Nevada National Bank to pay the coupon due January 7, 1918, of the first consolidated 6 per cent gold bonds of the Oakland Transit Company, a subsidiary.

MADERA, CAL.—The San Joaquin Light and Power Corporation is to build a new substation and power line to supply the district west and south of Chowchilla. The new plant will be erected five miles west of Chowchilla on the Robertson boulevard. A 60,000-volt transmission line also will be built.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company is contemplating rebuilding its distributing systems at both Bryon and Brentwood, with an independent substation at each place, on a 110-220 volt circuit. The plans provide for a lighting district in each town if the property owners so decide. C. S. Northcutt of Modesto is district manager.

SACRAMENTO, CAL.—A contract has been awarded by the Northern California Milk Producers' Association to the Clinton Construction Company of San Francisco for the construction of a new plant, which will include a cold-storage plant, power house, and a 30,000 gallon fuel oil tank. The cost of the plant is estimated at about \$125,000. Henry M. Ellis is manager.

STOCKTON, CAL.—The National Paper Product Company has completed its million dollar plant and started operations with 150 men. An additional 100 men will be employed as soon as possible. The plant has a capacity of 80 tons per

day, a monthly payroll of \$40,000, and utilizes electric power from the Western States Gas & Electric Company to the extent of 1400 horsepower.

COLUSA, CAL.—Some progressive farmers who live on the east side of the river near Princeton have formed a copartnership irrigation company, known as the Afton Irrigation Company. The tract that will go under water comprises 970 acres of land and the entire project has been leased for rice for two years to Attorney Ben R. Ragain of Colusa, who will install pumps and put in ditches.

SACRAMENTO, CAL.—The proposal to form an irrigation district in Big Valley, near Beaver, Modoc county, was presented to the State Department of Engineering during the visit of W. H. Chase, secretary of the Northern California counties, who headed a delegation of citizens. The project as outlined to Major Paul M. Norboe, assistant engineer, calls for the irrigation of 20,000 acres located in Modoc and Lassen counties.

LOS GATOS, CAL.—City Engineer Walker stated that he had investigated the lighting system and that he was of the opinion that considerable money could be saved and better service rendered if the city did away with the present arc lamps and installed 400 candle power lamps and placed the entire system on a meter. He estimated that it would cost about \$800 to make the change. He was instructed to carry on further investigation.

HOLLISTER, CAL.—Rights-of-way papers for the King City-New Idria power line have been filed by the Coast Valleys Gas and Electric Company and work will begin shortly. The proposed line will cost in the neighborhood of \$85,000 and when completed all machinery at the New Idria quicksilver mines will be run by electricity. At present the company generates its power with Diesel engines, using crude oil as fuel. The oil is hauled in from Mendota and is a source of heavy expense and inconvenience, being handled by truck.

ALTURAS, CAL.—The farmers along Pit river are planning to establish pumping stations on the river for the purpose of taking water out of the stream next summer for irrigating crops. The construction of five miles of power line and the installation of at least 65-horsepower motors have been arranged. A committee, J. E. Belknap, James Fitzhugh, B. W. Spicer, Silas Kelley and H. Stuber, is conferring here with I. W. Gibbins, manager of the Alturas Electric Light and Power Company. The promoters expect to complete the construction work by April 1.

SACRAMENTO, CAL.—A party of engineers of the Northern Electric Railway, working under the direction of a Sutter basin engineer, is making a reconnaissance survey of a proposed electric road through the Sutter Basin. The proposed line will connect with a branch of the Northern Electric railway to Woodland, about 2½ miles out of Woodland, thence constructed northerly about six miles, crossing the Sacramento river at a point five miles below Knight's Landing and thence up through the center of reclamation district 1500.

THE PACIFIC SOUTHWEST

GLENDALE, CAL.—The city rates on electricity were recently raised from 2c to 2.3c per kw-hr., service charges at the same time being changed from 50 to 75 cents.

LOS ANGELES, CAL.—The commission has authorized the construction of a power transmission line to serve the water bureau's pumping plant in the Elendale district at a cost of \$4100.

CHANDLER, ARIZ.—Permission has been granted to the Chandler Water & Light Company by the Arizona Corporation Commission to issue \$5,000 in bonds for improvements to its system.

SAN DIEGO, CAL.—The San Diego Electric Railway Company has begun work on the construction of an extension of its system to the local shipbuilding plant. The cost of the work is estimated at \$50,000.

ARCADIA, CAL.—The Board of City Trustees has accepted the bid of Fairbanks-Morse Company, of \$987, for a new 5 h.p. motor to be installed at the municipal water plant.

HEMET, CAL.—First steps for the purchase of the property of the Lake Hemet Water Company by the consumers under the system were taken at a recent meeting held at the Little Lake school house by the Consumers' League.

SAN PEDRO, CAL.—The Edison Company will enlarge its system at the Los Angeles harbor, according to the report of Chief Electrical Engineer Scattergood of the Municipal Bureau of Power and Light, and B. W. Mathews, Special Counsel.

LOS ANGELES, CAL.—Plans are being prepared by A. C. Martin, architect, Higgins Building, for the erection of a steel plant on Santa Fe Avenue, to include machine shop, foundry, warehouses, etc. The cost is estimated at about \$100,000.

LOS ANGELES, CAL.—Commander Norman Smith, public works officer for the 12th Naval District, announced in San Diego that the Navy Department plans early construction on a radio building at Inglewood, Cal., which will make that station one of the most important on the Pacific Coast.

CALEXICO, CAL.—The city trustees are making an investigation as to installing a municipal electric light and power plant. Mayor Abbot has been instructed to study the city plants of Pasadena and Glendale and make a report with recommendations. The rates charged by the Holton Power Company are declared too high.

HOLBROOK, ARIZ.—W. H. Clark of Los Angeles, Cal., it is reported, is head of a group of capitalists who contemplate a power project in a large lignite coal field about 72 miles southwest of Holbrook, and the erection of transmission lines to Globe and Miami, 75 miles to the southward, to points on the Santa Fe Railroad, and even to the mining districts around Prescott.

NOGALES, ARIZ.—At a recent meeting of the Nogales town council, proposals that had been invited for the installation of a modern lighting system were considered by the board. It is understood that the town will not be responsible for any initial outlay for installation, everything being supplied by the proposing corporation, and the town will pay for the service, giving a contract for five years or more.

EL SEGUNDA, CAL.—A resolution was introduced at a Board of Trustees meeting offering for sale to the highest bidder the gas franchise for the city of El Segunda, which is to run 10 years. After five years, the Southern California Gas Company is to pay the city 2% of its gross earnings. Bids will be opened February 13, 1919. It is in the intention of the gas company to commence work immediately upon the awarding of the franchise.

LOS ANGELES, CAL.—Approval of the issuance and sale of \$16,000,000 of its new securities is sought in an application filed recently by the Southern California Edison Company with the State Railroad Commission in San Francisco. The new financing is designed to put the company in position to begin work on a program for the development of 150,000 additional horsepower in hydroelectric plants to serve communities in the San Joaquin valley and in Southern California.

AZTEC, N. M.—The Southwestern Colorado Milling Company is going to develop the San Juan basin. They have purchased the Armstrong mill at Main and 15th streets in Durango, Colo., and have arranged to take over the Aztec Light & Power Company and mill at Aztec. The Durango mill will be remodeled at considerable cost and a large number of new buildings will be added. Work will be commenced in a few days on the Tiffany and Aztec plants, and shortly on Plant No. 4 in the Montezuma valley between Mancos and Cortez.

BLTYHE, CAL.—Material for the construction of a telephone line from Blythe to Rannels has been ordered by

S. D. Kamrar, manager of the Colorado River Telephone Company. Work on the new line will be started immediately upon arrival of the material. It is stipulated that work will be finished by March 15th. The Palo Verde Mutual Land and Water Company will have its private wire on the line, but has agreed to sublease poles to Mr. Kamrar for public use. The new line will follow the Rannels canal as nearly as possible—will go directly south from Blythe to catch the Rannels ditch at Neighbors. Branch lines will also be built.

SAN DIEGO, CAL.—The Vista water committee plans early action on a great project to develop the country. The committee met a few days ago to take into consideration the findings of expense as reported by Engineer W. F. McClure with reference to getting water from the Volcan Water Company for the contemplated San Luis Rey irrigation district. The plan contemplates the use of water of the San Luis Rey river, from which it will be diverted at the Werner Reservoir, taken down the south side of the river across the Valley Center country to a point near Vista, via the head of Twin Oak Valley. The water company will reserve the right to develop power as a by-product at the power drops on the main supply canal, in consideration for which the company will build power houses, machinery and steel penstocks.

THE INTER-MOUNTAIN DISTRICT

TONOPAH, NEV.—If proposals by the residents of Tonopah are accepted, the Tonopah Water Company will operate the plant at the Navada Gas Company, and Tonopah again will have a gas supply. The plant was closed three weeks ago because it was running behind each month.

BOULDER, COL.—The Cities' Service Company has purchased the control of the Western Light & Power Company, which operates in Boulder, Berthoud, Fort Collins, Windsor, Superior, Loveland, Greeley, Louisville, Lafayette and other points in Northern Colorado. Improvements involving an expenditure of over \$1,000,000, it is understood, are contemplated.

OGDEN, UTAH.—The city council is considering the question of establishing a municipal electric light plant.

WEEDE, MONT.—The Musselshell Valley Power Company has been incorporated here.

GILMAN, MONT.—The Commercial Club has appointed a committee to confer with business men on the question of constructing an electric light plant here. A financier is ready to erect such a plant and will do so if he has the support of residents.

LEWISTON, IDA.—Engineer E. W. Kramer of the hydroelectric department and James Gerard of the logging department of the U. S. Forestry Department with headquarters at Missoula, Montana, after preliminary investigation here, hold the view that Lewiston affords natural facilities for location of a sawmilling plant of 15,000,000 to 20,000,000 feet capacity annually, with a possibility of further development through dam construction in the river to furnish power. Engineer Kramer is quoted as saying in connection with the development of power that "The construction of the dam at Dry Gulch would develop at least 50,000 horsepower. I find conditions here far more favorable for hydroelectric development than I had anticipated."

COOK CITY, MONT.—The Western Smelter & Power Company with mine, smelter and power plant at this place expects to install a 100 h.p. motor to drive an air compressor at its mine, and to install additional transformers at its hydroelectric plant with which to step up voltage to 23,000 for transmission to other mines of the district. The company supplies lighting for this place also. It is to resume the operation of its smelter during the coming summer and is to build an aerial tramway two miles long to transport ore from its mine to the smelter. G. L. Tanzer of Seattle is president of the company.

THE VACUUM CLEANER

THE VACUUM CLEANER

SIDE LIGHTS are most illuminating in bringing out the shadows and modeling of the object displayed—and this holds good for persons and events as well as statuary. At least this is the theory of the Office Vacuum Cleaner who is here permitted to select such rays from the items which collect in its capacious bag as may prove especially illuminating.—The Editor.



The troubles of a line man are here immortalized in verse and picture by one of our electrical friends from Ashland, Oregon. If the verse is studied carefully,—or better still, the sketch,—it will need no reading between the lines to see why our electrical men made such good soldiers.



THEN YOU'RE A CARD MAN

After you've granted your half a year; after they've granted your card so dear:
After a whole kit of tools you have lost; after you've staggered at the mount of the cost:
After you're thoroughly loaded for bear; after you've learned to work and to swear:
After you know what 'dead' and 'live' means, after you've been jerked loose from your jeans:
After you've seen them get the wrong wire, after you've seen them play with the fire:
After you've had a dozen close calls, after you've had your share of the falls:
After you've burned a score of poles; after they've likened your head to the coals;
After you've burned up half a town; after you've made a line burn down:
After you've burned up the pots by the bank; after your spurs have broke off at the shank:
After your safety has pulled loose or broke; after you've 'most felt the heat of the coke:
After you've found yourself at a loss, after you've learned that the foreman's the boss:
When you've put in at last your three years as a groundman—
Then they've gave you your card—and you are a lineman.

—EMERSON ESTERLING.

To begin the dry season with the date of July 1st is a new adjustment of California climate, where the natives are accustomed to plan picnics with impunity the year round. Speaking strictly of the climate, however, the umbrella-bounded Easterner cannot get used to the idea of leaving home for an extended trip without this modern adjunct of civilization. Perhaps it was this fear of thundershowers and spring torrents, or perhaps it had to do with the shifting of the dry season above referred to, but at any rate, the eastern representatives of the Westinghouse Agent-Jobbers' Association which is to meet at Del Monte during the week of May 4 to 11 were greatly concerned with the question of wetness. Here is the reply sent them by S. H. Taylor of the Electric Ry. & Mfgs. Supply Co., who is largely responsible for the holding of the convention on this coast:

"Out here in California, where the orange turns to gold,
And nature has forgotten the art of growing cold,
There's not a day in all the year that flowers do not grow,
There's not a single moment that songsters do not sing,
And there's a constant conflict between summer and the spring
Oh, just the joy of it were worth one life to give,
Out here in California where it's just a joy to live."

The following contribution to the literature of the influenza epidemic is published in the Pacific Service Magazine as sent in from the office of Mr. W. G. Vincent, Valuation Engineer:

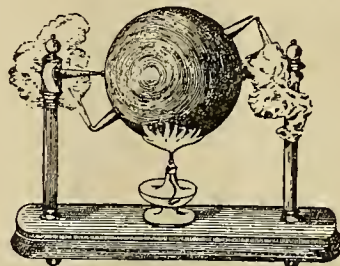
A malignant Spanish bacillus
Came over the ocean to kill us,
But it struck a real snag
In masks made of rag,
More effective than doctors who pill us!

Now that prohibition has become a national affair, it is perhaps taking no unfair advantage of the dry climate of the Northwest to tell the story on Oregon. There were various methods of obtaining vanilla extract and like reprehensible and alcoholic beverages devised for the arid population—and the gentleman who crossed the border from the south selling bottles of a dark liquid which he called tea found an excellent market. His method was to obscurely inquire as to the market for tea of thirsty appearing citizens, accompanying the question by a hollow whisper and a wink—and he had considerable success, getting as much as \$10 and \$15 in some cases. Later after he had disappeared and recrossed the line, the purchasers discovered that dark liquid of the purchase really was tea! The rest is unquotable.

ENGINEERS OF YESTERDAY

2. HERO

(A Series Compiled by A. L. Jordan)



Is the steam turbine a modern or an ancient invention?

In the writings of Hero, a Greek of Alexandria, is found a description of a toy called an "eolipile." When steam from the boiler below escapes from the two openings, the globe revolves. This is then the beginning of the story of the modern steam reaction turbine.

In This Issue: Electricity in Office Buildings and Department Stores

JOURNAL OF ELECTRICITY

VOL. 42 NO. 4

SAN FRANCISCO, FEBRUARY 15, 1919

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Big Convention Issue

The April 15th issue of the JOURNAL OF ELECTRICITY will be a special "Convention Issue" of exceptional advertising value.

The joint annual convention of the Pacific Coast Section of the National Electric Light Association, the Pacific Division of the National Electrical Supply Jobbers' Association, and the California Association of Electrical Contractors and Dealers, which is the largest gathering of the year of electrical interests west of the Rockies, will be held at Hotel Del Coronado, California, April 30th to May 2nd, inclusive, and the attendance will probably exceed 700.

Arrangements have been made with the JOURNAL OF ELECTRICITY to publish in its April 15th issue the full programme and papers to be read at this Convention. This issue of the JOURNAL OF ELECTRICITY will constitute the official distribution of the papers, and the Pacific Coast Section of the N. E. L. A. has ordered several hundred extra copies for special distribution to insure that its members and others who expect to attend the Convention may have ample opportunity to read and study the papers and be prepared to discuss them at the Convention.

The papers to be presented cover a number of subjects of particular interest to the electrical industry at this time, and this issue of the JOURNAL will therefore attract unusual attention not only from those interested in the Convention, but from its regular subscribers throughout the United States and Foreign Countries as well.

There is already a heavy demand for advertising space in this issue, and, in order to insure satisfactory service, it is imperative that copy and cuts be in our hands not later than March 15th, preferably before.

If you wish to reach the large buyers in the West among the Hydro-Electric, Steam Power or Industrial Plants, the Wholesale Distributors or the Contractors and Supply Dealers, this is an opportune time to do so.

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, FEBRUARY 15, 1919

NUMBER 4

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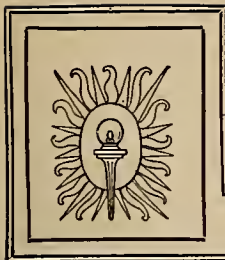
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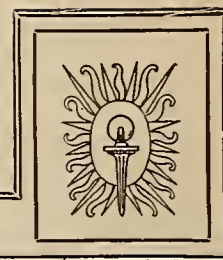


NEW ELECTRICAL RECORDS IN THE WEST —

Not only in electrical uses upon the farm and in the long distance transmission of electrical energy does the West excel, but the evolution of the method electrical in the department store and the large office building in the great populous centers of this vast district is each day bringing to light new records in achievement. Typical of this splendid march of progress is the great office building of the Southern Pacific Company at the foot of Market Street in San Francisco. Here the high Sierra has furnished twenty miles of piles upon which to rear a structure in a section formerly claimed by the waters of San Francisco Bay. And in this structure, which is said to be one of the world's largest office buildings, the use of electricity in handling the enormous daily traffic of people passing in and out, in the transmission of intelligence from office to office and in the lighting design for the convenience of its occupants, unquestionably has established records hitherto unattained in the evolution of the art.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, FEBRUARY 15, 1919

Number 4

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Nations are but the embodiment of the collective thought of their citizenry. Are you thinking constructive ideas on how world affairs may progress by mutual cooperative helpfulness on the part of all nations of the world? Such thoughts alone can aid in establishing world peace and international prosperity, and without them a League of Nations to enforce peace is of no avail.

The electrical supply jobber occupies a position of readiness to serve in the present stress of affairs that is unique in the industry. Never in history has the opportunity been so good as at present for the jobber to be of value to the contractor, central station, independent telephone operator and retail merchant. The best authorities agree that commodity prices will undoubtedly seek lower levels during 1919, and merchandise stocks should be held to the lowest possible minimum. The laying in of large stocks, at prices that may seem low for the time being, should be avoided. The best advice to follow is to buy for current needs only, and depend on your jobber to keep your stock in shape. Numerous small shipments may be more expensive to handle, but will be vastly less expensive than the maintenance of a large stock which is steadily depreciating in value. In these days of uncertain railroad service, where the value of freight is liable to decline heavily while in transit, avoid heavy factory purchases, and let your jobber carry the stock for you, thereby "spreading out thin" over the entire industry such losses as may occur.

In this ability and preparedness to serve the industry during the present crisis, the electrical supply jobber occupies a strategic position that justifies beyond the question of a doubt the strong confidence felt for him by the industry as a whole.

The necessity of installing proper baseboard receptacles is a problem that each day grows in importance due to the gigantic increase in the use of electric appliances. Some indication of its magnitude may be gleaned from the fact that last year's sales in electric apparatus in America totaled in value over ten million dollars.

It is a problem, however, that must be handled

with considerable tact and diplomacy. Unquestionably the extra cost of installing baseboard receptacles, especially in houses already built will, if not properly handled, affect the sale of appliances. At the same time undue fear should not be allowed to control the mind of the public in regard to the fire hazard, for false conclusions are liable to be drawn.

Faced squarely, the problem as a whole is briefly about this. With the appearance of the electric iron and some of the lighter electric loads, customers found easy access to the electric fixture to be a matter of such convenience as to greatly accelerate the introduction of electric appliances. The single socket was soon replaced by a two way socket, then the three way socket appeared in order to allow ever increasing use of appliances. Soon the capacity of the fixture wires was in some instances exceeded, fuses blown and troubles ensued. Then came the vacuum cleaner with its pulling and twisting effect upon the fixture and the consequent injury to the fixture.

Meanwhile the central station did not pass by without complaints in service—complaints of poor lighting due to over-loading of wires and often interruptions of service caused by the blowing of fuses, and even in some instances the burning out of meters.

There is no question but that the use of electric appliances—mammoth as may seem their output in sales to date—is but in its infancy. It would seem then that the only worthwhile solution is to face the issue squarely.

Data should be gotten as to carrying capacities of fixture installations and the consumer should be advised tactfully and frankly as to a reasonable and sane use of the fixture, and in addition he should most emphatically be educated in the use of the baseboard receptacle and its excellent economic features. Among such features may be classified a greater ease and facility in service, a saving in heating loss from meter to receptacle, a possible better rate in house

insurance, and the fact that a baseboard receptacle power rate of practically one-half is usually allowed by power companies under separate meter measurement.

While the installation of an individual baseboard receptacle for each room may at first glance seem difficult to bring about, its accomplishment can be attained little by little in an enlightened campaign of education. Especially can great strides forward in this regard be brought about by a fair and open campaign and discussion of its merits with the leaders among the architects.

In fact, the joint cooperative helpfulness with the architect on the one hand and the manufacturer, jobber, central station and contractor-dealer on the other is needed, for in a delicate problem, such as this, fairness and evident desire to do the square thing will after all accomplish the only worthwhile results—namely, the greater use of the electric appliance that brings about the easing of human burdens and at the same time the forwarding of safety to property and the individual combined with an economic saving.

Considerable attention is being given in these days of readjustment to increasing the port facilities of the Pacific Coast cities to meet the growing demands of Pan-Pacific commercial interchange. Local development leagues are taking active steps in several of the larger sea ports to investigate the present conditions and see how electrical energy can have the better effect increased facilities in loading and unloading ships and in clearing the approaches from material of commerce as fast as it accumulates, thus greatly enlarging the capacity of dockage and general port equipment.

In one particular seaport the electrical development league of that section has even gone one step further—namely, to bring out discussion looking toward actual results in this matter of such great present-day import. Electricity can undoubtedly play a far more effective part in cargo handling appliances, portable machine conveyors, and in the installation of an extensive electrified system of belt roads interconnecting with the various wharves, than it does at present.

Such investigation is a matter of prime importance and undoubtedly the resulting installations in electrical equipment will in the not far distant future vastly extend the uses of electrical energy and at the same time add an increased prestige for the port where such installation is made.

More and more it is coming to be recognized that personal contact of men engaged in the electrical industry with the various national selling organizations is a matter of great importance to the future of the industry. Men engaged in this selling activity, due to the constant urge under which they labor to acquire the latest

and most improved ideas necessary to sell their product, are in position to absorb and assimilate the promise of business opportunity quite often more readily than those directly upon the ground.

The readjustment period in which the West now finds itself involved is a period of perhaps more hope and promise to the electrical industry than ever before in its history. The great need is to have the nation as a whole know more of its worth, its present splendid accomplishments and the gigantic commercial and engineering future that is immediately before the West due to its vast natural agricultural and water power resources combined with the strategic position Pacific Coast ports occupy in the vast Pan-Pacific development now under way.

In view of these facts, the forthcoming National Jobber-Agents' meeting of the Westinghouse Electric and Manufacturing Company with its hundred representatives from every quarter of the nation at Del Monte, California, May 4-11, 1919, is a meeting of unusual significance to the electrical industry in the West. And it is hoped that their presence among us will prove as profitable and helpful to them as we know the good effects their inspiration and enthusiasm for the industry as a whole will be to us.

Learn to increase your efficiency by studying the elementary laws of electricity, is the slogan that is more and more felt throughout the electrical industry in the West. Power station operators, electrical contractors, substation operators, linemen, telephone operators, electrical salesmen, public utility employes, may well heed the urge of this hour of world readjustment—perfection in a technical specialty.

Announcement is being made through the Extension Division of the University of California of an unusually helpful course in technical instruction, one that should receive the hearty endorsement of every well-wisher for success of men engaged in the electrical industry throughout the West. It is a course covering the elementary laws of electricity, series and multiple, circuits, voltage, drop, power and watt loss, efficiency, wire calculations, motors, generators, illumination and a host of other helpful discussions that may be undertaken through correspondence by the payment of a small fee. This course has the unusual feature of combining technical discussions from a great number of practical men of the electrical industry—central station men, telephone men, contractor-dealers, jobbers, electrical engineers and manufacturers—compiled in conjunction with the Journal of Electricity. Further information may be gotten by addressing the Director, University Extension Division, Berkeley, Cal.

The first article of this series will appear in the columns of the Journal of Electricity March 15, 1919. These articles will in themselves serve as the text for the course. Supplementary explanations, sets of problems, questions and answers will be furnished by the Extension Division to such students as regularly enroll in the course.

**Westinghouse
Jobber-Agents'
Meeting**

trical industry with the various national selling organizations is a matter of great importance to the future of the industry. Men

It is questionable if ever before an opportunity has been offered for advancement in technical instruction through correspondence that so happily harmonizes with the demands of technical study and practical illustration and application.

The Journal of Electricity is glad to be of assistance in forwarding this enduring work and to give to it the helpful advice dictated by an experience of thirty-two years in reflecting the electrical growth of the West.

The usual Spring politics is now going the rounds over nomination for officers for the various national engineering societies. It is a pretty poor time to allow anything else than service to the particular society to influence choice in these matters. It is time that geographical districts must come in for consideration in order to have proper expression and completeness in the executive control. The main question at issue, however, is to secure men for the positions that will give active time and attention to the work and keep some life and enthusiasm in Western centers in their relationship with the parent societies.

The interest in joint engineering society effort in the West continues apace. At Seattle, where much of the excellent results in effort of this sort received its pioneer initiation due to the untiring work of Mr. Lindsay of the Puget Sound Traction, Light and Power Company, effective results seem unusually near accomplishment.

Due to the stress of war conditions much of this splendid work had to be allowed to lag. A renewed interest is now apparent, and a large attendance and interest is assumed for future meetings.

The instance at Seattle is typical of renewed activity in engineering matters throughout all the Pacific Coast centers. Separated by thousands of miles from the parent societies, engineers in the West have found that development of the local section idea is the only salvation for mutual interchange of ideas.

It is believed that the West is aiding in developing this local section idea and the idea of joint society effort to a harmonious and efficient degree not attainable elsewhere in the nation.

It is a well known fact that in spite of the great importance of water powers, many of the potential powers in existence must of necessity prove economically useless, either on account of their great distance from centers of industry, the lack of transportation facilities, or from the fact that the storage necessary to give a continuous or fairly continuous supply would be too costly.

It is interesting to note in this connection a rather complete summary of European and Canadian costs for electrical installations that have recently appeared in the Electrical Review of London.

An examination of some 120 European installations shows that for large installations of upwards of 10,000 e.h.p., the minimum cost of the hydraulic works is \$40.80 per h.p. installed, and the maximum, \$387.50 per h.p. For the majority of the installations the cost lies between \$121 and \$218. The cost of the electrical generators, switchboards, etc., and transmission lines, also varies greatly, ranging from \$6.00 to \$138.00 per h.p., while the cost of the turbines ranges from \$19.45 to \$38.90 per h.p. The working costs vary between \$6.30 and \$33.00 per e.h.p. year, with an average value of \$14.60. From these figures it appears that on the average, making an allowance of 15 per cent for interest and depreciation, the cost per e.h.p. per annum is in the neighborhood of \$51.00.

In many installations, however, the cost is very much less than this. The Ontario Power Company, for example, is able to supply power to the Hydro-Electric Commission of Ontario at \$8.75 per e.h.p. per annum. It is estimated that many of the large powers in Canada can be developed at a total cost, including all generating machinery and transmission lines, ranging from \$58.30 to \$97.20 per e.h.p., in which case the cost per h.p. per annum should not exceed \$9.70 to \$14.60.

In view of the vast systems of storage that are required for the major power developments of the West, coupled with the necessity for building long and costly transmission lines, many of these great projects do not measure up to the low cost of installation as set forth in the above statistics for European and Canadian practice.

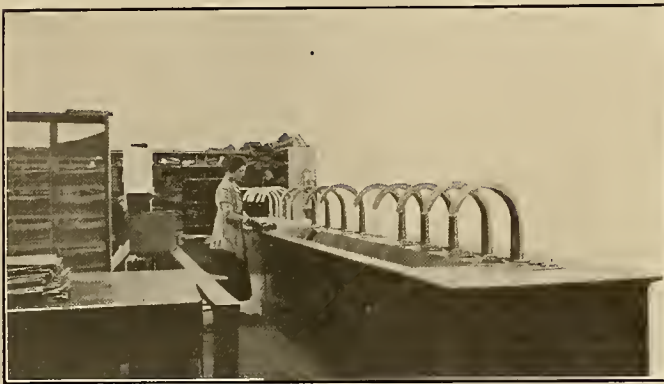
However, the extended agricultural and industrial uses to which hydroelectric power in the West is as a consequence applied in a district where fuel costs are unusually high has been the means of developing this type of energy to a degree unequaled anywhere else in the world.

NEW JOURNAL SERVICE: The Coronado conventions, consisting of the Pacific Coast Section, N. E. L. A., the California Association of Electrical Contractors and Dealers, and the Pacific Division, National Electrical Supply Jobbers' Association, are fast molding into concrete form. Men of the industry in all parts of the West are busy planning papers and collecting data for this important gathering of the year which will take place during the week April 28-May 3, 1919. The Journal of Electricity will feature this great convention in its issue of April 15, 1919, and in it will appear the official papers that are to be the basis of discussion at the gathering. It is expected that this issue of the Journal of Electricity will set new ideals of editorial attainment in helpfulness to the West.

ELECTRICITY IN A LARGE OFFICE BUILDING

(There is no more promising field for the applications of electricity in both large and small units than a great office building—as is clearly indicated by this general description of the Southern Pacific building of San Francisco. That its equipment is far more complete than that common in such buildings is proof of the field still open to the electrical man along these lines.—The Editor.)

The Southern Pacific Building, now the headquarters of the U. S. Railroad Administration, which is located near the ferry on Market street, San Francisco, is the largest office building west of Chicago. It is said that the building contains floor space sufficiently great to accommodate the entire population of California at one time without crowding. The ground upon which it is built is a part of the city which was reclaimed from the bay and it is necessary to rest the buildings of that district upon piles.



The main station of the pneumatic tube system, which interconnects all offices and does away with the necessity for messenger boys within the building.

Twenty miles of piles are said to have been driven in the construction of the Southern Pacific Building.

Aside from its size and the picturesqueness of its construction the building is of special interest from the completeness of its electrical installation. From pneumatic tubes to electrically operated elevators, electricity is used wherever possible. Clocks are electrically operated, the building is provided with an electric fire alarm system, the water for use throughout the building is electrically pumped, and the air electrically renewed.

One of the most interesting features of the building is the lighting system. Probably in no other office building of its size have the excellent results been obtained at a less expense, with no impairment to the effectiveness of illumination. In the first place, of course, spacing and candlepower were very carefully figured to obtain even and adequate distribution of light, but the fixture itself is the factor of particular interest. The Southern Pacific Company has innumerable buildings scattered throughout the West, from stations to warehouses for which it is responsible for the supply of fixtures. This item therefore becomes a very large one in its orders—and owing to the variety of tastes among those who made the choice of these objects, a very troublesome one. In order to simplify the matter and to reduce this element to a standard item, a uniform design was chosen for all Southern Pacific buildings. The advantages of this system are obvious. Not only are shades obtained at the cheapest price and re-

placements easily cared for, but any lights dismantled need not go into the scrap heap but may be put into the stores for use elsewhere. The system of



The lunch room of the S. P. building is known as one of the most well managed employees' dining room in the West. Electric appliances are provided for the convenience of girls wishing to add to their lunch from home.

lighting adopted is the semi-indirect with neat pressed glass bowls which fit appropriately into any surroundings.

The pneumatic tube system is of particular interest. There are many occasions in which correspondence or other papers must be transferred from one office to another, and to save the excessive traveling about the building and the cumbersome nature of any delivery system devised, tubes are provided connecting all the offices. That is to say, tubes connect all offices with the main station where the carriers are redirected and sent to the office marked. By revolving the cap until the indicator points to the required number, any office may be designated as its destination. The receiving station in each case is a conveniently located niche in the wall with a space below for receiving the carriers. The system has proved eminently satisfactory and requires only such attention as the few attendants at the main stations give in redirecting the carriers. An interesting feature was the method of locating the various stoppages which occurred when the system was first installed. The suction element proved too alluring for various of the younger members of the organization who tried its effect on other objects than the regular carriers, with the natural result that the system temporarily ceased operating. With genuine ingenuity, the vacuum cleaner was applied to the balky tube and the various objects abstracted. In some cases, however, the stoppage proved too stubborn and it became necessary to dig in through the wall or floor at the proper spot and open up the tube. After the first few days no difficulty was experienced with the system. The motor which provides

the exhaust for the pneumatic tubes is located in the basement and so arranged that it varies with the load. Any object blocking the passage of the tube, that is, mechanically affects the speed of the motor and thus increases the exhaust.

The clocks of the building are also electrically operated and governed by a master clock located on the ground floor. There are twenty-four in all and several time clocks which are connected in this same system.

An important part of the electrical installation is the provision for pumping water. One pump is used for filtered water and one for the storage tanks on the roof, of which the overflow is used for flushing and the like. The ordinary run of water pumped is about 28,000 gallons in eight hours—and it has run as much as 50,000 gallons in twenty-four hours. An interesting feature in the handling of water is that the level of the basement is below the city sewer system, and in consequence all water used here must be pumped up to this height. The walls are painted up to this point to mark the level. A deep well was sunk 300 feet below the building and a pump installed with a view to furnishing water for the storage tanks, but there was found to be too much sand present and the project was abandoned.

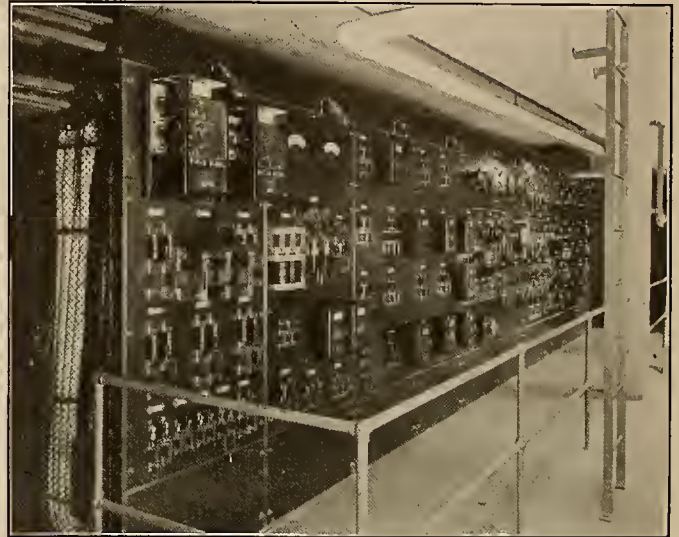
The building is electrically cleaned and ventilated. One vacuum cleaner machine suffices, with outlets on each floor. The ventilator fan is located on the eleventh floor and is of the exhaust type. It serves to ventilate the three floors where large departments are located and the continuous change of air is an essential. The exhaust pipes lead along the ceiling of the second floor and thus to the outside.

A service department is provided for women employees of the building on the top floor where there is a library, rest rooms and a lunch room and kitchen. The coffee receptacle is steam heated, but several electric toasters carry out the electrical idea in this department. With the extremely large number of young women employed in this building, it was, of course, something of a problem how to handle them efficiently during the lunch period. This was eventually accomplished by staggering their rest hours, releasing a group every ten minutes from 11:40 to 1:00. In this way the kitchen is kept clear and the girls find both space and time for a comfortable meal.

The main switchboard is located in the basement in the main engine room. The d.c. side carries the current used for the various motors in use throughout the building. The energy for the running of the elevators does not go through the switchboard but is taken direct from the bus bar at the back to the eleventh floor where the motors are located. Very slow motors are used in this connection with a direct wind drum, 26 r.p.m. The main load is carried on the a.c. side. This governs the current for lights, dictaphones and general use. The lights are so arranged that two or three floors can be switched off at once, thus saving considerable time in a building of this magnitude. Public lights are separate so that in case of fire they will not be

switched off, but corridors, elevators and main doorways remain lighted. The switchboard is provided with a peak load recorder, the records of which are of considerable interest as showing the time of heaviest burden and the effect on this of the weather and the daylight saving law.

Aside from the a.c. and d.c. service for the building, the stores and sidewalk elevators and the sprinkling system of the entire building are provided with independent service. The sprinkling system is an A. D. T. system with thermo couples. Any great



The main switchboard in the basement. Elevators are not controlled from this board but the current is carried direct from the bus bar to the eleventh floor where the motors are located.

change in temperature or interference with the system starts the bell to ringing in the engine room and at the same time in the offices of the A. D. T. service. Three tanks under pressure are provided on the roof of the building as part of the system.

An especially railroad application of electricity is found in the extensive telephone system of the building. There are literally hundreds of regular telephones located within the building, and aside from that, the company has its own system which connects all offices of the company. It is possible not only to telephone but telegraph to Sacramento and other offices of the Southern Pacific over these lines, all within the company's system. A special adaptation of this is in the handling of pullman tickets. Considerable confusion used to be met with in the selling of tickets at different offices in San Francisco, but this has now been obviated by the use of the telephone. A central station handles all the business with rotating files and records at hand so that the operators may reach them conveniently. In this manner both error and delay are avoided.

There are, of course, many minor uses of electricity, such as the use for the operation of office devices and the like, which have not here been mentioned. In fact, such an office building is a small city in itself, and if there are any uses of electricity adaptable to its circumstances not yet in use, it is only a question of time and the education of the individuals concerned until they may find their place.

TELEPHONE SYSTEM OF CREDIT CHECKS

BY CLOTILDE GRUNSKY

(The department store is an important consumer of electricity in its lighting alone—but also offers opportunities for the application of electricity along other lines, as is indicated by the unique system of checking credits here described. The electrical contractor as well as the power company will find here a suggestion of what might be developed as additional business along this and similar lines.—The Editor.)

The question of credits in a large department store where there are some 150,000 charge accounts is one of the most serious problems with which the business must contend. In former days it was customary to permit unlimited accounts from all accredited customers. The individual was always investigated before the account was opened and investigated if it proved unsatisfactory and various difficulties were noted as they occurred by the credit department, but in general it was merely a question of whether the customer had an account at that store or not.

piled up, they were not always handled in exact order of arrival and some one customer might become extremely impatient. Moreover the check must be handled several times and re-sent back to its original department so that there was considerable room for error.

A recent electrical installation which consists of a central telephone exchange and various stations located in all parts of the store has greatly simplified the work and made errors almost impossible. The system is very simple. The main station occupies one corner of the fourth floor where there are located cylindrical card index systems containing data on all credit accounts and where Mr. Neper, head of the department, is always at hand to decide questions beyond the province of the operators. There are 160 local stations located throughout the store where the clerk taking a charge order may talk directly with the credit department. The sales check is placed in an automatic device by the clerk and if the operator



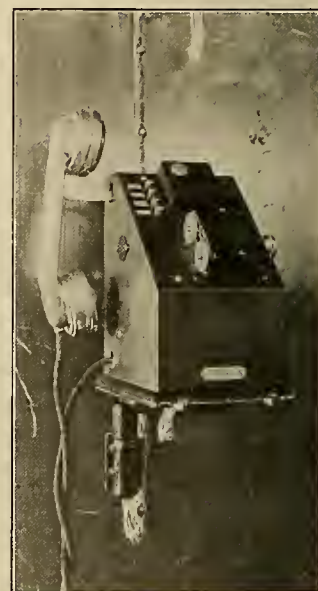
CHECKING UP CREDIT ACCOUNTS

The four circular files contain the names of all customers having charge accounts, the first two running from A-K, the second from L-Z. By pressing the button so indicated, the operator can O.K. a sales check in any department of the building.

The White House (Raphael Weill and Company) of San Francisco have solved the problem very satisfactorily by the installation of a telephone exchange in their credit department. The White House is one of the largest stores in San Francisco and some time ago felt it necessary to initiate the method of limiting accounts. Individuals who were good for a small amount might prove unsatisfactory customers if permitted to charge beyond limits, certain accounts needed watching and there came a time with some when credit was withdrawn. This system, of course, necessitated very careful checking of charges as made throughout the store.

The system formerly in use was one of automatic tubes which carried the sales check to the credit department where the account was looked up and the slip stamped with the proper O.K. if satisfactory. This had numerous drawbacks. The sales checks were often crumpled and illegibly written and there were numerous delays. It was not always possible to attend to the checks at once, the carriers

The sales check is inserted in the machine and the button pressed which corresponds to the initial of the customer's name. If the operator at the other end finds the account satisfactory, she punches the tag to that effect. There are 86 call stations in the building conveniently located for every department.



who handles the account in question finds the amount to be within the prescribed limits she presses a button which punches the sales check at the other end and serves as an official O.K.

For convenience in handling, all accounts are divided alphabetically into four divisions, each of which is indexed on two of the rotating racks. There are four stations on the main board, each of which thus handles two divisions if necessary, one regularly and one if the operator next is absent. The local stations are provided with buttons which indicate these divisions, A-E, E-K and so on. If Mrs. Brown wishes to charge a \$25 hat, the saleswoman in the hat department places the sales tag in the machine and presses the button marked "A-E."

This flashes a light at the switchboard of the operator handling these accounts, white on the switchboard regularly handling this division and red on the switchboard next. At her earliest opportunity, the operator plugs in at this point, this operating a buzzer at the local instrument which notifies the clerk to take down the receiver. The clerk now gives name, address and amount of sale. The operator has an index of all accounts from A-K before her and quickly notes the one in question. If the account is clear and the charge is not an abnormal amount, the operator now presses the button which punches the check.

A further safeguard against error is the little pilot light which shows on the switchboard just alongside the button if the sales tag is correctly placed in the machine. If this light does not flash, the operator knows that something is wrong and so notifies the clerk. There are usually four operators at work, but provision is made for eight workers for rush periods such as the holiday sales, each switchboard being divided into two parts by the pressing of a button. It is further possible to concentrate all calls on one switchboard for convenience at such off hours as before the store opens or after it has officially closed when special cases may need attention.

The system of indicating accounts is most expeditious. Ordinary white cards are used as a basis

with the name, address and limit to the account visible at all times. If the account is bad or other difficulties have come up, a slip of colored celluloid is slipped over this name and indicates to the operator at once the state of the account. Eight colors are used. Thus red indicates an account against which no further charges are allowed, yellow—one on which something must be paid before it is increased, green—an account against which charges have been made by persons unauthorized, and so on. Some few accounts are unlimited and are so indicated, most bear figures following the name, such as \$100, \$500 and the like. This indicates that the total amount of the account is not supposed to advance beyond that figure. Operators are permitted to O.K. all charges up to 10 per cent of the figure there shown without further authority. Anything beyond that or anything on a questionable account must go to the head of the department. A master telephone makes it possible for members of the credit department to switch into any conversation which has gone beyond the province of the operator.

This installation is, of course, but one feature of the credit department which has many duties, one of which naturally is to revise the ratings of accounts periodically in the light of monthly bills and payments.

The switch board is manufactured by the National Cash Register Company and installed by the Western Electric Company.

ELECTRICALLY EQUIPPED LABORATORIES

BY C. B. MERRICK

(Schools, colleges and hospitals offer opportunities for the special adaptation of electricity to laboratory needs. The following article on the electrical installations of the parasitology laboratories of the California State Board of Health, located at the University of California, suggests some of the specialized uses to which familiar appliances may be put.—The Editor.)

Service and adaptability in the real meaning of the words, are the characteristics of electricity that recommend it so highly for use in bacteriological and hygienic laboratories. The special purposes to which it is applied call for compactness, reliability, and readiness for use at all times. That the method electrical fulfills these exacting conditions is readily shown by its increasing popularity and extended use. New and better equipment aid progress in scientific research, and to the extent that electricity surpasses other methods, just so far is the nation indebted to electricity for the marvelous secrets disclosed by her investigators.

Electric Incubator

At the parasitology laboratories of the State Board of Health of California, on the campus of the University of California, a standard Petaluma Electric Incubator has been fitted up with special trays as required and is used in the incubation of the eggs of the hook-worm. That it can be entirely relied upon for accomplishing its work is shown by the satisfactory results obtained and the detailed records of its action kept for a period of more than six months. In the photograph this laboratory incubator is shown with one of the doors open, revealing the thermometer and pilot lamp at the extreme left

of the open space. At the top can be seen the heating coils, and in the center, the thermostat which is the master mind of the equipment. The thermostat controls the contactor located just below the incubator, which in turn regulates the flow of current



Petaluma electric incubator for hatching hook-worm eggs

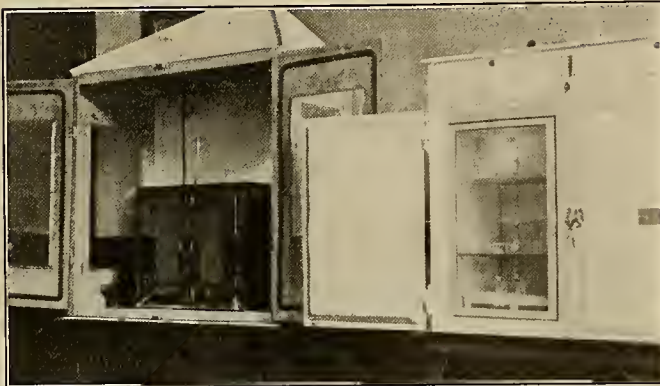
through the heating coils. The pilot lamp is connected in parallel with the coils and flashes on each time the coils are connected to the line, thus indicating whether or not the machine is working properly.

At the right of the photograph is shown the centrifuge which is used for concentration purposes.

The electric motor gives the high rotational speed and consequent centrifugal force necessary for settling the heavier particles from the liquids in which they are suspended. The stirring device with the motor attached assists as a time saver, also, by being continually ready for use, as soon as connected by merely pressing into position.

Hatching Bacteria

In the second photograph is shown at the right a Freas' Electric Incubator, particularly for incubation of bacteria and protozoa, with readily adjustable temperature control at the top center of the incubator. This control may be set to automatically maintain any given temperature merely by setting the knurled button at the desired position. The second oven shown is a Paraffine Oven in which the paraffine is prepared for embedding and infiltration of tissues. It is difficult to conceive of the possibility of slicing tissues to a thickness of only .001 milli-



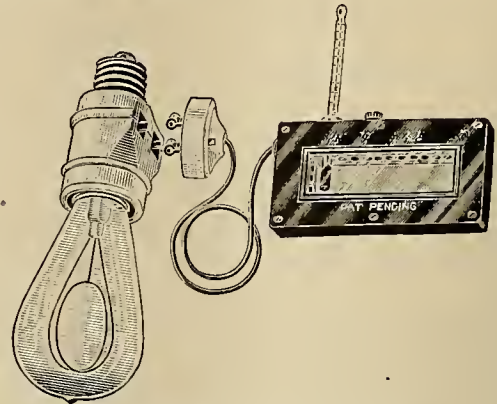
Electric incubator and paraffine oven for the infiltration of tissues. This makes possible the slicing of tissue to the thinness of .001 millimeter for the preparation of slides.

meter and without this process it undoubtedly could not be a success. By infiltration of the tissues with melted paraffine, and allowing the paraffine to solidify, they can be placed in the microtome and the layers of the above thickness sliced off by means of a razor-edged knife. Here again electricity plays its part, for the microtome is run by a motor. As the slices are cut each adheres to the one previously cut until they form a sort of ribbon. This ribbon is mounted on slides, the paraffine stained as desired, and investigated by viewing through the microscope.

Electricity and the Microscope

Even the microscope has not escaped the attention of the electrician, for an electrically heated microscope stage is used for research work on particularly sensitive bacteria, some of which would die if subjected to an extended change of temperature of two degrees from normal. Thus it is necessary to keep them at normal temperature in order to observe their natural characteristics. This is accomplished with the aid of the stage, which as indicated is connected in series with a lamp so that the current flowing through the lamp also flows through the heating coils of the stage. A thermometer indicates the temperature, so that the operator can maintain it at the required value. Electric light for illumination of the slide in the microscope is preferable to daylight illumination because of its greater uniformity and

constancy, as well as its easier manipulation for showing the minute details of the subject under investigation. Consequently it is used almost to the exclusion of daylight.



An electric warming stage for keeping bacteria or protozoa warm while examining them under the microscope

Thus electricity is coming to play a more and more important part in the scientific field as well as in the home and industrial field, and is constantly demonstrating the convenience and necessity of its use. With the constant acceleration of present times, its advantages become more apparent.

SERVICE INSTALLATION REQUIREMENTS

(A recent ruling of the San Francisco Department of Electricity on the separation of power and lighting loads which is of interest for purposes of comparison and reference.—The Editor.)

1. In each installation where there is a connected power load of 5 h.p. or more (in addition to a lighting load), provision shall be made for separately metering such power load.
2. In each installation where there is a connected heating load of 5 kw. or more (in addition to a power or lighting load), provision shall be made for separately metering such heating load.
3. In new installations, separate services may be installed for the lighting load and the power and heating loads. Each separate service shall supply the entire lighting load or the entire power and heating load in the premises.
4. In old installations where additional lighting or power utilization equipment is installed and the existing service is insufficient to carry the total load, including the increase, an additional service may be installed. Such additional service shall be of sufficient capacity to carry the entire lighting or power and heating load in the premises. The new service shall extend to the existing meter location and the necessary changes made for separate supply and metering of lighting or power and heating loads.
5. A single service switch shall not be required for the entire load, but each service shall be provided with a main service switch entirely disconnecting all the wires of that service.
6. Where separate service switches are provided for lighting or power and heating loads, the legend, "Lighting," "Power" or "Heating," as the case may be, shall be placed on the outside of the cabinet in letters similar to the requirements for service switch lettering.

HUMAN NATURE IN ADVERTISING

BY H. A. LEMMON

(It may not be complimentary to say that the advertising man has learned what he knows from Satan, but it is merely another way of saying that he deals in human nature. When you advertise the comfort that the electric heater is to bring the customer, rather than so many feet of cord and wire coil which are to be obtained at such and such a price, you are using the methods which have won out in the conflict of human character from time immemorial. The author of this entertaining parable is sales manager with the Truckee River General Electric Company.—The Editor.)



Some things seem to need no advertisement—but in reality what we know as human nature is merely responding to the most alluring bid of the moment.

WE could have told you that the patron saint of all builders of advertisements is one Mephisto Beelzebub Satan. In all Creation he is the master wizard of publicity, and if we might but study his methods we need search no further for that wisdom which never fail us. When the Lord created Eve he undoubtedly intended that she should eat the apple—eventually—otherwise he wouldn't have created the apple. He had given to Adam and Eve—those specimens of what was later to be the human race—every material thing in existence, and made it available to them without effort. But there was left out of them those great energizing forces of individual initiative and ambition which go so far toward character building. These were incorporated in the apple. They were withheld from Adam and Eve for the purpose of interposing a slight, and by no means insurmountable, obstacle to their attainment, and included in the rules of the game were certain apparent penalties for the purpose of establishing as early as possible that great fundamental truth that we must pay for any worthy thing we may gain by sacrifice of something which we already have. And it was disclosed to Eve that if she were prepared to pay the price she could gain, in return, "knowledge."

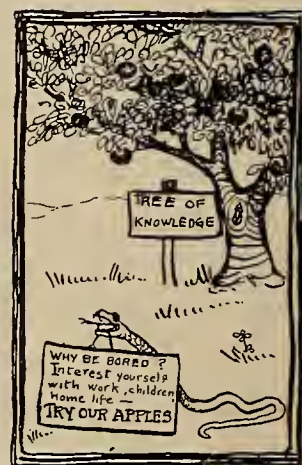
The First Advertisement —

This promise of the great boon of knowledge in trade for individual sacrifice constitutes, I believe, the first advertisement of which we have any record—but it was pitched upon too high a plane and was out-of-date even then. It stimulated no desire in Eve and she neither bought nor bit. Subsequently Adam and Eve continued to live a life of idleness—both mental and physical—without reason and for no apparent purpose—a condition we sometimes momentarily envy but one which is instinctively abhorrent.

Mr. and Mrs. Adam, as a matter of fact, were existing in an atmosphere of "what's the use." They had no memory of yesterday because yesterday was but as every other day which went before; they had no interest in today because today could be but twenty-four hours more of individual inaction; they had no concern for the morrow for tomorrow would bring no responsibilities, no new pains, no unexpected pleasures and no soul-trying disappointments.

A stroll throughout their perfect domain was invariably barren of adventure or thrill, for even the beasts were friendly and simple; the magnificent trees breathed no whisper of their divine being, and neither the birds nor the flowers could impress upon human understanding the glory of their gorgeous beauty. Incapable of emotion, life to Adam and Eve

Labelling the apple tree "Tree of Knowledge" was perhaps the first advertisement—but it was unsuccessful. Why should Eve eat an apple? It was not until Satan stimulated her imagination by pointing out the advantages to be gained that she was interested. He has been disposing successfully of even doubtful wares by the same method ever since.



was as interesting, as exciting and as necessary as it is to an angle worm.

And yet, why eat the apple? There was an infinite variety of fruits easily available which were satisfying, as experience had demonstrated, while the apple promised only "knowledge," an indefinite thing not known to be desirable, even.

The advertisement failed; it was foredoomed to failure just as it will always fail.

A More Successful Attempt —

And then there came upon the scene Mr. M. B. Satan, who had ideas of his own. Satan's position in the Divine scheme at that time is not clearly revealed to us but there is no reason we should consider his reputation as other than fair to good, a little wild, perhaps, but withal a young man of tremendous energy and enthusiasm, who friends predicted would make his way in the world and later on be heard from. Satan appraised the situation instantly and discerned wherein that first advertisement had failed. It didn't stimulate Eve's imagination; nothing ever had stimulated it, and nothing ever would have under the then existing circumstances. So he first set himself the task of developing that god-given quality in that first woman. He did this by a series of confidential conversations—got Eve off by herself, not conspicuously in a manner to create scandal, but discreetly, and he began to put notions into her head which fanned the spark he found slumbering there. And then—and only then—did he pub-

lish his advertisement—the second in the history of mankind.

The Picture of the Result —

He didn't merely promise "knowledge" if Eve would abandon her perfect, ready-made home and take up a life of toil; he didn't tell her she would grow old and withered and eventually would perish; he didn't dwell upon the fearful price she would have to pay in return for something she did not know she desired; but instead he painted a picture on her brain, mixing his colors with the imagery of her own imagination. He painted a picture of days of happiness and never-ending delights; of character-developing sorrow; of days of healthful, satisfying



Mr. Mephistopheles does not advertise the price of his wares, but the delights to be attained through their use. The moral of this little homily on human nature is to be seen when you apply the principles to selling—say, a vacuum cleaner. It is the clean house and the health of the baby and the freedom from drudgery the housewife buys, having forgotten in the delights of her picture the number of dollars she must give up to attain it.

weariness closing in complacent repose; of the companionship and the dangers of the beasts, no longer to be friendly and all alike; and he gave her a glimpse into that hitherto unexplored magic realm of appreciation and imagination—the music of birds, the beauty of gorgeous flowers, the inspiration of love, the glorious destiny of motherhood, and then, finally, when contentment and weariness had blunted and softened the joy and the pain of the great adventure, the peace of death.

And Eve bought and ate the apple; just as she has been doing ever since, and just as she always will do so long as she may have a place upon this earth.

Now it happens that that advertisement was the product of a new and hitherto untried school, and although centuries multiplied by centuries have since proved it to be the only type worthy the great artist, it was considered unethical at that time, with a result that its author was thrust out of the Divine Galaxy and forced to shift for himself in the guise of a serpent.

A Good Thing Misused —

We are not called upon to pass judgment upon Satan's subsequent career, even though we may feel that he acted hastily—took his banishment too seriously. Undoubtedly he was a young man of morose and sensitive temperament, as indeed is common with geniuses; but we can at least give him credit for playing the game in the open. At no time has there ever been any mystery, any concealment of his plans or his methods, and to the latter we owe

all we have learned and all we ever will learn about effective, creative advertising. And in any event let us not be unmindful of the fact that Satan gained for mankind that which we must ever esteem the highest of all gifts—appreciation and imagination.

But to return: Satan swore a terrible oath that he would prove to all the universe, first—that the snake is the king of beasts and second, that his methods, instead of being unethical are fundamental—the A, B, C of all human achievement. And he wagered the most precious thing in his possession. Having given a soul to man by imaginative advertising, he turned him about and began to rob him of that gift by precisely the same agency.

But It Works —

Much has been said pro and con regarding Satan's domestic affairs, but we are concerned only in a critical analysis of the means by which he secured such unvarying results. As advertising men we must pay our homage to success.

His methods are plainly written in every step of the wanderer's path; in every line of the failure's face; in every eye of society's victims, and in every hour of the criminal's hell. He offers to all who may wish to buy, prosperity and happiness—with never a word about the price to pay.

He doesn't sell wine to me as wine. Instead he offers relaxation, merriment, congeniality. He doesn't tell me that I may obtain these things at a bargain price of so many hours of drugged vitality, so many more of remorse, and still so many more of sacrifice of essential things; instead, his advertisement appeals to my imagination until everything gross and everything sordid is obliterated by a glorious vision of exhilaration.

He doesn't paint a picture on the brain of youth of prison bars, desertion by friends, unutterable misery for loved ones, as the price he must pay for that money which belonged to another. Instead he uses the vivid pigments of his artistry in portraying the joy possession of that money will bring.

Its Application —

And so he goes on, playing up and down the scale of human emotion—visualizing adulation in this advertisement; happiness and contentment in that one; dignity and respect in this other one—proving over and over that he has solved the problem of selling his wares—and wondering why we do not read the lesson: Reject his methods, but adapt the underlying principles to the benefit of those we wish to serve. Why do we persist in selling apples, when we might as well be selling human experience?

TELEPHONING FROM THE TRAIN

The train telephone for voice transmission between a moving train and a dispatcher's office has been given official tests in Canada and has demonstrated its efficiency. The device worked successfully in connection with trunk line telephones in general commercial service, and also between a car of the train and the locomotive. The transmission is made through wheel and axle, without the aid of a contributing medium.

PLANS FOR THE CALIFORNIA CAMPAIGN

(The California Cooperative Campaign has proved itself a success in such a concrete way that its work is to be extended and intensified for the next year. The scope of the plans for the immediate future are sketched in the following extracts from the report of the Advisory Committee. What some of the electrical men who have come in contact with the working of the campaign can say of its accomplishments is to be judged from the letters from contractor-dealers, jobbers, central station men and manufacturers which follow.—The Editor.)

Because of the need for conservation during war time and because of the great difficulties being encountered in helping the contractor-dealers with their educational development, there were some who suggested during July and August that the California Electrical Cooperative Campaign should be discontinued. It was seen that some of the contractor-dealers were becoming discouraged and that the continued existence of their association was endangered.

The Advisory Committee very carefully reviewed this situation and discussed it at its meeting in Fresno in August. The Committee decided that every effort should be made to hold the contractor-dealers' association together, and to encourage the individual contractor-dealers to maintain themselves in business by directing their efforts toward work which would help win the war.

Papers for the get-together meeting at Los Angeles on October 4th were carefully written by individuals and edited by the Committee with this decision in mind. The members of the Committee, without exception, felt that they would be failing in their duty to the industry if, at this critical time, they failed to do their utmost to direct the resources of the industry in California toward winning the war and toward holding associations together so that the efforts of the individual member might bring the greatest results, not only during the war but in the readjustment period after the war.

This decision and action by the Committee has been favorably commented upon by those contributors with whom it has been discussed. The members of the Advisory Committee feel that all contributors will endorse it.

The war is now over and in contrast to the abandonment of association activities in many other trades, the California Association of Electrical Contractors and Dealers is still in existence and stronger than ever, and the organization of the California Electrical Cooperative Campaign is intact and in operation. There exists therefore an organization which has weathered adversity and which has a firm foundation on which to build further cooperation work and thereby give assistance to the various branches of the electrical industry in California during 1919.

The Advisory Committee is in much better position to give assistance in the educational development of the contractor-dealers during the present period of readjustment and the periods of active business thereafter because of the continuance of its operations during the past year.

Contributors Pleased with Work of 1918

Another evidence of the success of the campaign is the readiness with which the contributors to the fund have renewed their contributions for the year 1919. The California Association of Electrical Con-

tractors and Dealers, the Electrical Supply Jobbers of California, and practically all of the central station companies have renewed their pledges.

The original plans as drawn in 1917 provided for the participation of these three groups only, but at the last minute, in order to complete the funds to the estimated amount required, five manufacturers were invited to contribute to the aggregate amount of \$1320. Three of these have subscribed increased amounts for 1919, and the other two have subscribed the same as in 1918. The Committee felt that there should be a more general participation by the manufacturers and to that end electrical manufacturers generally have already been, or soon will be, given an opportunity to subscribe. Twenty manufacturers have to date subscribed a total amount of \$3250 to the 1919 fund.

It was also decided to add another manufacturer representative to the Advisory Committee. The appointment of Mr. K. E. VanKuren, District Manager, Westinghouse Electric & Manufacturing Company, Los Angeles, California, has been approved by the Executive Committee of the Pacific Coast Section, N. E. L. A., the Executive Committee of the California Association of Electrical Contractors and Dealers and by the authorized representative of the Electric Supply Jobbers of California.

Field Work to Be More Intensive

During the year 1918 decidedly better results were obtained in the southern section than in the northern part of the state. This was due in no small measure to the fact that Mr. Spring was able to do more intensive work there than could Mr. Brainerd in the northern section, which includes approximately twice the area and population. The Committee considers that it would be unwise at this time to decrease in any degree the active work of Mr. Spring in the south by assigning more territory to him. Indeed, it is considered necessary that all sections of the state should be given the same intensive attention. To that end a third field representative will be added as soon as a man satisfactory to the committee can be employed.

A portion of the large territory now handled by Mr. Brainerd will then be handled by the third field representative.

The plan, started in October, 1918, of furnishing suitable advertising copy to central stations and of encouraging dealers and contractors to tie-in with the central station advertising by doing more advertising themselves, will be continued on an even larger scale. The results so far secured fully justify this action.

The report has shown how, responding to the campaign suggestions, dealers and contractors have become more active and aggressive in going after the business. Some have added solicitors to go out

and sell appliances. Many dealers have not the field in which to properly use a solicitor's services continuously, but would use one for short periods at intervals throughout the year. In order to supply these dealers with high grade solicitors, the Advisory Committee will organize a staff (one, two or more, as may be necessary) of competent, experienced solicitors. These trained men may then be employed by various dealers on a compensation basis approved by the Advisory Committee. Dealers should be able to materially increase their appliance sales by making use of this particular campaign service.

Exhibition Assistance Planned

The Committee will also organize a Demonstration, or Electrical Show Staff to meet demands for assistance in the operation of cooperative appliance campaigns and demonstrations.

The contractors, dealers and central stations who cooperate in putting on an electrical show, demonstration or campaign, will be required to pay for the trained demonstration services. In this, as in the case of the solicitors, the Advisory Committee expect to pay from the campaign fund only organization and general supervisory expenses.

The individual firms using the services of the solicitors, demonstrators, and show organizers, will be required to pay the main items of salaries, commissions and traveling expenses. These plans are advantageous in that well trained and experienced assistants can be secured by the contractor-dealers for short periods at reasonable cost.

A Salesmen's Auxiliary Planned

A greater and more general use by the dealers of the appliance sales report is very much desired. To assist in encouraging the dealers to use and to send in these reports and to assist in such other work of the campaign as may be from time to time delegated to them, a Salesmen's Auxiliary will be organized. It will be composed of traveling representatives selected from the organizations of contributing jobbers and manufacturers and who, with the consent of their principals, will in addition to their regular duties give some special attention to the work of the campaign.

The Salesmen's Auxiliary will be a fully organized body with a chairman, three vice-chairmen, and a secretary, reporting and responsible to the Advisory Committee. A salesman may be appointed to membership in the "Auxiliary" by a two-thirds vote of the Advisory Committee, the approval of his principal having been first obtained.

This auxiliary will perform such duties as may be assigned to it from time to time by the Advisory Committee.

Throughout 1919 it will be the earnest endeavor to bring about every condition within the power of the Advisory Committee that will tend toward building up the contractor-dealer. To that end the Field Representatives will continue their endeavor to add to the membership of the California Association of Electrical Contractors and Dealers. As this association is of a permanent nature and one in which the main object is the development of its members by

educational methods, the Advisory Committee feels it desirable to increase that association's membership to the greatest possible number so that the educational work undertaken by the Committee may be carried on and cover the broadest possible field when the Cooperative Campaign shall have accomplished its purpose.

The service of the Electrical Industry to the people of California must be still further improved and enlarged if our industry is to share to the greatest degree in the prosperity that is to come during and after the readjustment period. Cooperation and educational development are the means by which to ensure this improved and enlarged service. The contractor-dealer particularly needs to develop in this direction. Cooperation in its broadest sense should be his during 1919. The California Electrical Cooperative Campaign is in a position to bring this about to a much greater extent than ever before.

LETTERS ON THE COOPERATIVE CAMPAIGN

The Central Station Satisfied

S. Waldo Coleman, president and general manager of the Coast Counties Gas & Electric Company and a careful student of the relations of the power company to the public, writes of the Cooperative Campaign:

Though the contractor-dealers in our territory and ourselves have cooperated well together in the past, yet this cooperation has been increased by the mutual education received from the California Electrical Cooperative Campaign. We have especially appreciated the very successful work of the field representative, Mr. Brainerd.

Our company, having entirely withdrawn from the sale of electrical appliances, looks to the contractor-dealer as our "New Business Agent," so considering the electrical industry in its entirety, this places the responsibility of the retail sale of electrical appliances strictly up to the dealers, so that we are more interested than ever in aiding in their development as electrical merchants.

This company is entirely satisfied with the results of last year's business, and as you know we have already signed up for the coming year.

Yours very truly,

COAST COUNTIES GAS & ELECTRIC CO.,

S. WALDO COLEMAN,

President and General Manager.

The Jobber Approves

C. B. Hall, secretary and treasurer of the Los Angeles branch of the Illinois Electric Company, speaks from the standpoint of the large jobber in his cordial support of the campaign. He says in part:

The work of Mr. A. L. Spring, field representative in this territory, has acquainted the contractors and dealers with the meaning of the word "cooperation" to an extent which I believe would have been impossible in any other way. My observation of a limited number of stores and store windows I have had an opportunity to inspect, leads me to believe he is certainly on the right track. The friendly spirit he has been largely responsible for arousing among the dealers themselves and with their local lighting office is of itself of no little value.

It is only by exchanging ideas and a "get-together" spirit that any appreciable progress can be made in any line of business nowadays, and this is particularly true of the

ever-changing methods of the electrical industry. The co-operative spirit shown by the central stations in their attitude towards the contractors and dealers means more for the future than most of us realize.

One of our large dealers in this city recently mentioned to me the fact that for the first time two large annual electric installations had been made by the contractor, in contrast to the work being done by central stations in the past, with satisfactory results to all concerned.

The merchandising policy of the central stations is beginning to make the dealer realize he is now in a fair way to become a real merchant. The stimulation of the dealer and contractor in newspaper advertising is of itself a big factor in the advancement of the electrical business. This should be encouraged to the greatest extent possible.

If the large manufacturers have seen the wisdom of this sort of thing in the big magazines, it goes without saying that local work can be done just as satisfactorily.

"LET THE GOOD WORK GO ON."

Yours very truly,

C. B. HALL.

Lee H. Newbert, chairman of the efficient Advisory Committee which has supervised the California Electrical Cooperative Campaign during the past year. The work has achieved such definite results that its scope is to be deepened and expanded for 1919. The committee has the following membership: L. H. Newbert, Commercial Department Pacific Gas & Electric Co., Chairman, D. E. Harris, sales manager Pacific States Electric Co., R. M. Alvord, manager supply department General Electric Company, M. L. Scobey, manager Home Electrical, San Francisco, G. E. Arbogast, president Southern California Contractors and Dealers' Association, K. E. Van Kuran, Los Angeles manager Westinghouse Electric & Manufacturing Company, A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, A. W. Childs, assistant general agent Southern California Edison Co.



Encourages Individual Effort

M. A. De Lew, president of the California Association of Electrical Contractors and Dealers, foresees good effects from the campaign far beyond the limits of the state:

The committee has in a very large measure accomplished its primary purpose—the coordination of effort of men in the electrical industry.

The word cooperation has of late been so largely used in a socialistic sense that the misgivings of some have been the cause of the undertaking and the accomplishment of real difficult work. Cooperation as it is understood today and as it must be understood in the future is the very highest degree of "Capitalism," thus its success can only be assailed by the knave and his efforts can be but a retarding action.

To my mind the plan has been and will be such a complete success that but few of us can anticipate its bearing on the whole electrical industry throughout the entire nation.

It has not only been eminently successful in its primary object of coordination of effort, but has also seen the seeds of its labors bear fruit. In spite of the sacrifices made by all electrical men during the war every branch of our industry stands today even on more solid ground. No doubt, in a measure, about all of us have been hit financially, but our principles have taken firmer root—the dollar does not stand between the principles of American citizenship and ourselves. The broad principles of cooperation as taught and enunciated under the guiding spirit of the Campaign Committee and its many adherents are very largely responsible.

That the power companies, the manufacturers, the jobbers, the contractors and the dealers not only have seen the light of cooperation and followed its precepts, but are contributing to the funds for its extension in increased amounts, speaks in far more eloquent words than your humble servant can pen.

My observation of the Board having this undertaking in charge is somewhat limited, yet I can safely say that the old adage of "putting your shoulders together" does in no wise apply—they are putting their brains together, in fact, the Advisory Board are a real example of "cooperation."

Sincerely,

M. A. De LEW.



A. L. Spring and W. H. Brainerd, who have acted as representatives of the California Electrical Cooperative Campaign, respectively in the southern and northern divisions of the state. The work has been so satisfactory that C. C. Davis, formerly connected with the Pacific Hardware and Steel Company and the General Electric Company of San Francisco, has been appointed a third representative to specialize in the San Francisco district. It has further been decided to add an assistant to the representative in the southern district.

The Manufacturer and the Campaign

Dr. Addison, Pacific Coast manager of the General Electric Company and looked upon by many as the dean of the industry in the West, is in hearty accord with the work of the campaign:

I think I have been trying to preach cooperation for a quarter of a century. Not because of my preaching, but because it is the inevitable thing leading to the highest efficiency of all-round prosperity, it has for the past few years been coming along very rapidly.

I agree with you that the California Electrical Cooperative Campaign is a good thing and ought to be continued.

Very sincerely yours,

Th. ADDISON,

Pacific Coast Manager.

Money Well Invested

S. M. Kennedy, general agent for the Southern California Edison Company, who has built up a national reputation for himself in the handling of problems of electrical merchandising, speaks for the central station in the southern portion of the state:

This company has been keenly interested in the Cooperative Campaign, and those in authority have felt that the money contributed toward carrying on the expenses has been well invested. The company has signified its willingness to continue its contribution for the year 1919 with the expectation that the work will be as carefully planned and carried on as during the present year. It is our opinion that the same amount of work next year will produce results that will be even more satisfactory than those of 1918.

With kindest regards,

Very truly yours,

S. M. KENNEDY,

General Agent.

From the Contractor-Dealer in the City

J. C. Hobrecht, one of the live business men of Sacramento and active in contractor-dealer organization, feels that the campaign has made an excellent beginning, worth pushing with even greater energy:

In the earliest of recorded history we have the story of a man who said, "I am not my brother's keeper," and it is further chronicled that this man became an outcast and a wanderer upon the face of the earth.

Coming down through the ages, some of the spirit of this man has lingered in the race and from time to time great men have arisen and great movements have been put under way to combat and eliminate this spirit; so it was that when big, unselfish men in the electrical industry saw this spirit of Cain even among their own associates and brothers in business, they arose and determined upon its eradication, and as one of the means to this end came into being the "California Cooperative Electrical Campaign."

Just how far and in what manner it accomplished its purpose, it is not possible to discuss in a short letter. The very apparent results, however, should be enough to convince the leaders in the Campaign that their efforts were appreciated and encourage them to further good work along the same or improved lines.

The experience of the past year has been valuable; there has been some criticism, justifiable and otherwise, but the one was welcome and the other expected; that, however, does not alter the fact that the electrical industry is on a better basis today in California than it was a year ago, and much of this can be directly traced to the California Cooperative Campaign.

The very fact that men from all the branches of the industry were willing to put their money into a common pot to be spent for the common good shows conclusively that they believe in the interdependence of the various branches and that only through cooperation can the best service be given.

"Service"—that word is the keynote of the whole campaign; the service that it renders humanity is the only excuse for existence of any business or industry. Profit is result of service and is determined in the end by the efficiency, quality and quantity of service. We will all agree on the point that we could render a great deal more and better service if the public only knew what we could do for them; right here is where the advertising feature of the Cooperative Campaign steps in. Results here are not always as apparent as the weak-hearted ones would like to have them, but they are the surest and most lasting. But as the electrical industry is rather new in the advertising business, let us remember a recognized axiom that "A weak-hearted man should never start advertising." Now is the time of test,—shall the electrical industry come out as strong-hearted men with vim, vigor and pep, or shall we drop back into the groove of: "Everyone for himself and let the Devil take the last?"

The writer believes, now that we have the spirit of Cain on the run, let us keep him going; let us go to the Cooperative Campaign with redoubled efforts; let us be big enough to forget the little mistakes, the local or personal slights, if we feel any; let us look with a broad vision upon the results, and not feel only in our own pocket for them.

There is no doubt the Campaign has been a success; there is no doubt it can be made a greater success. The experience of the past Campaign should be capitalized; let us not lose what we have gained—let us go to it again with a "strong heart."

Yours very truly,

J. C. HOBRECHT.

The Contractor in the Smaller City

S. F. Jones, of the firm of Winder and Jones, electrical contractors of Covina, tells what the Cooperative Campaign has meant in the intensely developed citrus belt of southern California:

We have watched with considerable interest the progress of the California Electrical Cooperative Campaign in this section and the following are some of the results it has accomplished.

The retail electrical business has been made more attractive to the contractor-dealer by the central stations changing their methods of merchandising appliances. While they have been in the past in unfair competition to the contractor-dealer, they are now selling on an ethical retail basis, which has encouraged the dealer to put more effort into his retail business. We have also noted with pleasure that we are receiving improved cooperation from the central station in our section in connection with our contract work.

We find that the campaign has stimulated the contractor-dealers in their efforts to secure profitable business and the manufacturers and jobbers have been influenced by this activity to such an extent that they now put forth efforts to help contractor-dealers secure business. Where we formerly came into competition with the manufacturer or jobber whose goods we were selling, we now find that they are cooperating instead of competing with us.

The campaign has been of great benefit to us in improving our selling and bookkeeping methods. Its field representative in this section, Mr. A. L. Spring, has given us a great deal of valuable assistance and advice regarding merchandising of electrical appliances. He has assisted us in laying out our new store into which we expect to move within the next two weeks. In planning our windows at the new store, we had just accepted a straight front design, when Mr. Spring came along and told us we were all wrong and insisted that Mr. Winder and myself spend a half day with him in Los Angeles going around to different electrical stores, seeing the show window arrangements. Before he got through with us he had us convinced that he was right and we built our show windows after his suggestions and are very well pleased with them.

Before the campaign started there were no members of the Electrical Contractors and Dealers' Association in this vicinity, while now we are all members and cooperating nicely.

We are extremely well pleased with the results of the campaign and believe its continuance for another year or two will be a great benefit to the industry and will bring about a condition that will justify the central stations withdrawing from the appliance business and put the contractor-dealer in a position to properly handle the retail distribution of electrical merchandise.

Yours very truly,

WINDER & JONES,
S. F. JONES.

Pleased with Accomplishment

H. B. Woodill, president of the Woodill & Hulse Electric Company of Los Angeles, speaks in hearty commendation of the results achieved:

I know that the Campaign in the last year has done what some of us have tried to bring about in the past fifteen years, therefore my saying that I am pleased with it is certainly putting it very mild. Cooperation has finally taken on its characteristic meaning as far as the Electrical Campaign is concerned.

Yours very truly,

WOODILL & HULSE ELECTRIC CO.,
H. B. WOODILL, President.

THE STORAGE OF ELECTRIC SUPPLIES

(The storage of electric supplies which vary from washers to conduit and rolls of wire in a way to secure dispatch in handling as well as an attractive display of the stock is a difficulty presented not only to wholesalers and jobbers but to retail dealers as well. The new office and warehouse of a San Francisco wholesale firm are examples of what may be done along that line.—The Editor.)

The storage of material of diverse weight and bulk, usually in the dark recesses of a basement store room, is one of the major problems of the wholesale dealer in electric supplies. The new offices



No open packages are allowed on the two main floors, but when such occur are stored on the shelves on the mezzanine floor which is to be seen in the picture. Stairs lead from both front and back, and a chute and heavy freight elevator provide facilities for handling even heavy materials.

and warehouse of the Baker-Joslyn Company at First and Howard streets, San Francisco, have been arranged with a view to the greatest convenience in handling and shipping goods.

The main feature of the building is its light. It is an attractive concrete structure providing two main floors and a mezzanine, so built that practically the entire outer wall space is of glass. This means that artificial illumination is necessary only on very dark days or after nightfall, it avoids any confusion, makes for ease in handling materials and insures against accident of any sort.

The offices are located in the front of the main floor and carry out the idea of light and convenience. They are separated by glass partitions, protected by sash curtains up to sufficient height to give privacy and protection from the sun. Woodwork is in a light finish and the open spacing of desks and records presents a most orderly and attractive appearance. A rest room has been provided for the women employees with table and wicker chairs and cloak and rest room facilities, where it is possible for the employees to eat their lunch. Electric appliances for the making of toast and hot water are provided for their common use. Adjoining this is a small store room for office materials and old records which are kept neatly in files and in enclosed cupboards so that they are well protected from the dust.

Directly behind the office is the main storage room, which receives light both from the glass front along Howard street and also from the front of the

building through the glass partitions of the office. All very heavy materials are stacked on this floor in order of their size. There is no basement to the building and the whole theory of arrangement has been to avoid handling heavy materials any more than absolutely necessary. For this purpose the shipping and receiving department is centrally located here. A driveway for wagons slightly below the level of the floor permits the truck to be backed into the building, a great convenience in wet weather or when traffic is heavy on the street, as well as a saving in the handling of material. Directly to one side of this is the shipping office with a window where the drivers may receive their orders. The elevator and chute from the upper floors terminate



The main storage space is both well lighted and well arranged. The shipping department is centrally located and all material stacked with a view to convenience in handling.

just at the other side of the driveway, so that incoming or outgoing materials may be expeditiously handled. A large scale sunk into the floor is also convenient to hand for the weighing of the heavy supplies.

Materials are stacked or otherwise arranged in accordance with their shape in aisles, so that any may be reached and handled without disturbing the others. Barrels are stacked by laying boards between each layer on either side, forming a sort of track with a depression in the center on which the next layer is rolled. A barrel stacker which hoists the barrel to the proper height has proved a great convenience. It is operated by a crank and saves both time and effort. Heavy conduit, which is one of the most difficult materials to handle, is stacked on end between rests directly to one side of the shipping platform, so that it needs very little carrying. Washers and similar material are kept in bins with slanting shelves convenient to the scales.

The mezzanine floor is provided with shelving in alcoves for lighter materials. Although broken



In contrast to the basement storage room which is both inconvenient and poorly lighted, the walls of this office and warehouse are almost entirely of glass—and it is only on the darkest of days that artificial illumination need be used at all.

packages are not usually handled, occasionally in the case of unusual supplies such occur—and these are stored here. No broken packages are allowed on either of the main floors. Small package and light material such as V.V. Fittings, wood pins and brackets are stored here. When the installation is complete a placard which will be legible from the floor below will be attached at the end of each alcove and will give the bin number and contents for convenience in locating. A portable light with a wire guard is provided between shelvings. Materials of especial value such as spools of magnet wire are kept in a room specially provided on this mezzanine floor under lock and key. The room faces the street and is also provided with interior windows of heavy wire grating, however, so that it is both light and well aired.

The top floor is not subdivided in any way and presents a large expanse of floor space for storage. The entire two sides of this room are glass and skylights are arranged in the farther corner so that the illumination is almost perfect. The reels of wire are arranged at either end of the room with free aisles running the length of the building, so as to give measuring space down the floor. Coils are stacked horizontally or stood vertically between two boards laid along the floor like tracks, with occasional up-rights against which to test the rolls. Barrels of glass and porcelain insulators are stored here, being material which is compact and readily transported. Although all the material is heavy it is easily handled and may be sent to the first floor by way of the chute.

The elevator is an extra heavy freight elevator of two-ton minimum capacity, with a combination of electric and hydraulic operation. It may be operated from any floor and is provided with all safety devices. The chute may also be used from both second and mezzanine floors and is guarded at each opening by safety rails to prevent accidents.

An adequate system of lighting, operated by pull chains, is provided throughout the building in addition to the daylight illumination, so that operations may be carried on after daylight hours with perfect safety and convenience. The whole effect of the building is one of neatness and of practical service in the expeditious handling of varied supplies.

Western Ideas

CHECKING UP ADVERTISING RESULTS proved to the Southern California Electric Company of Los Angeles that one of the most inexpensive mediums of advertising was the most effective. It was their own windows, according to J. Rendler, president of the company, as quoted in Contact.

"Every time we put in a real live window we tallied in a jump in sales. Having proved this to our satisfaction we concentrated on live windows, collecting good ideas from everywhere."

As to frequency of changing window displays, Mr. Rendler's study has given him decided ideas.

"The secret of attracting a crowd, according to what we have learned," he says, "lies in frequent changes in our windows. We rearrange the apparatus in the window every week without fail, and every two weeks we change the entire layout. Practically everyone who passes our windows has gone by at least once in that time, and must be presented with a new scene if his attention is to be held.

"When we plan a new window we aim high. We try to inject life into it, either in color or in action."

The success of the Southern Electric Company's displays has been so great that a number of smaller electrical dealers make regular bi-weekly trips to look at them and get new ideas.

When to show prices in the window and when not, is a subject that this company has worked out by trial.

"We have a steadfast rule," they say, "never under any circumstances to advertise the price of expensive apparatus. We never put a price tag in the windows for more than \$10.00. People have an idea that electrical appliances are expensive, and our aim is to gradually overcome this notion."

"When we are making a special drive on some particular piece of apparatus, an iron or a toaster-stove, we price that article in the window and nothing else. This focuses attention on these articles and has led many customers into the store.

"After all, our main object is to get customers into the store. Our salesmen are trained to do the rest."

LIGHTING UP for the boys who come home, is the latest recommendation of the Society for Electrical Development to merchants generally—and particularly to the electrical industry who will find a good business in supplying the electricity, the signs and the lamps for the patriotic displays.

Some idea of the magnitude to which the plan of welcoming the boys home electrically is being carried can be had from the facts regarding the



One feature of the patriotic illumination on Portland's "Broadway"

equipment that is being installed for the New York Times Building, and which consists of over 5,000 10-watt lamps distributed as follows: The entire building will be outlined with 300 two-foot stars, each star containing eleven lamps, alternating red, white and blue on a flasher. On the 43rd Street side, facing Times Square, will be a cluster of Allied flags, surmounted by a spread eagle holding the American shield. This display utilizes 1000 lamps and will measure 40 ft. wide by 24 ft. high. The flags will have a waving effect, and over this will be an electric sign reading "VICTORY," in six-foot letters. At each of the four entrances of the building will be a pair of crossed American flags waving, these will contain 250 lights each. And on the roof will be four flashlights illuminating the American flag flying from the flag staff.

The movement is not confined to New York, however, but is nation wide. The American flag shown here flashes nightly on the main street of Portland, Oregon, and is just one of thousands of such patriotic emblems to be found throughout the country. Every city and town which has boys to welcome home—and what town has not?—has the incentive to decorate for their home-coming. The opportunity open to the electrical industry to make these decorations electrical is obvious.

A BARGAIN AT \$12.50 was advertised by an eastern power company to extend its housewiring campaign. The Elmira Water, Light and Railroad Company of Elmira, N. Y., through its commercial department, recently hit upon this plan for interesting the house owner.

“Any five-room home wired complete for electricity with service connection and lights for \$12.50” was the slogan of the campaign. This, of course, was the “leader” and it was the salesman’s duty to

inform his prospect that the \$12.50 five-room offer included open wiring—wires strung along the ceiling frequently seen in offices and some apartment houses instead of concealed between the walls—and that light was provided by a hanging bulb. As a matter of fact, such an offer showed a small loss to the company on each contract.

The campaign was profitable, however, as comparatively few of the prospects took advantage of the offer, most of them preferring more costly installations.

Every house-owner interested was interviewed personally with the result that 4000 contracts were secured out of which number only 15 signed for the original \$12.50 five-room job.

THE NAME AND ADDRESS of the person you want to get in touch with is often a very elusive thing. You may want to reach a business acquaintance out of office hours—or locate a man whose telephone is listed under the name of his firm. For this reason the little handbook recently gotten out for the

[illegible]

A place to find just the information you want about just the people
you are constantly in touch with

Engineers' Club of San Francisco is a particular convenience. The book contains the constitution and by-laws and committee lists as well as the list of members, but its main purpose, of course, is to present this latter in convenient form. The membership is divided roughly into resident and non-resident groups and members in the service are marked by a star and their rank noted in addition to giving their local address. The information given comprises: name, business address, business telephone, occupation, home address and telephone. The convenience of having this data at hand can readily be recognized—and suggests a similar compilation of the membership of electrical organizations. Particularly in the case of contractor-dealers' associations, where the telephones of members are generally listed under the name of the firm, some printed slip which would give initials, business, home address and telephones would prove invaluable—and an additional link in the working together of the organization.

THE USE OF THE BLOTTER as an advertising medium has been taken advantage of by ink dealers and employment bureaus, but its use by a

society to advertise its meetings is something of a new application. This means of calling members' attention to meetings has been initiated by R. B. Mateer, well known to electrical men of the West through his work here some years ago, who is now chairman of the publicity committee of the Philadelphia Section of the A. I. E. E. Blotter advertising has the advantage of keeping the reminder always at hand and bringing the matter every so often

doesn't rain, but if it does the umbrella is mighty convenient to have along. The tag here illustrated is an example of how trouble is avoided by the Edison Electric Appliance Company, Inc., by answering before hand all the questions which are likely to come up. The tag is one designed for circulation water heaters and immersion units and is attached to each of these instruments before it leaves the factory. On one side is a complete diagram of the installation, showing just how the instrument should

A LEAF FROM THE 1919 CALENDAR	
THURSDAY JANUARY 9, 1919	8.00 P. M. —MR. GUILLIAM H. CLAMER, "Oscillatory Currents in Electric Furnace Practice."
MONDAY JANUARY 13, 1919	6.30 P. M. —McAdoo Dinner. 8.00 P. M. —MR. PRESTON MILLAR, "Lighting in War Times". 10.00 P. M. —Social Hour.
MONDAY FEBRUARY 10, 1919	6.30 P. M. —Get-Together Dinner. 8.00 P. M. —PROF. JOS. W. RICHARDS, "The Importance of the Electric Chemical Industry". 10.00 P. M. —Usual Refreshments
WRITE THESE DATES ON YOUR DESK PAD	

An announcement which will be seen

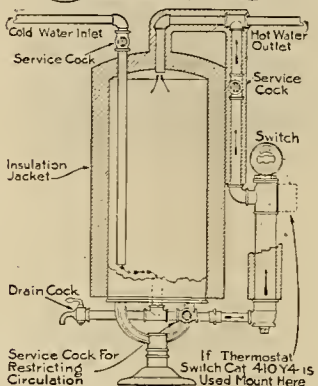
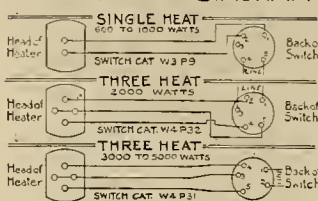
directly beneath the eyes of the person to be reminded. Any one who has noted the scroll designs and triangular curlicues which decorate the blotters of many a business man who plays with his pencil while he thinks or telephones, will appreciate the opportunities of the blotter. It is true enough that a man may rub his hand over the advertising of an insurance company for many months without ever becoming conscious of the subject matter, but let his mind once run on the question of insurance and the notice always before him will catch his eye. In the case of a meeting of which the man is wanting a reminder, it will serve as the pin-prick needed for action. Why not make use of this in place of sending out a card announcing your next meeting?

THE ADVERTISED USE of an appliance is not always the only one it may be used for. The electric heater may be used as a hair dryer, the disc stove as an iron for handkerchiefs and small articles as well as its normal use, the electric iron is a temporary bed warmer. As for the vacuum cleaner, it may be used to follow the lawn mower and pick up loose grass—or as recently reported by a salesman of the Pacific States Electric Company, as a blower on an oil burner in the town of Livermore. A Thor washing machine was also located by this company in the home of a walnut grower in Southern California who used the machine to wash clothes on Monday and to wash his entire crop of English walnuts on other days. The X-ray Reflector people have found a new use for floodlights as discovered by Hobrecht & Company of Los Angeles. The farmers of this region have ordered floodlighting projectors for lighting rice fields to keep the duck and geese away at night.

The moral, of course, is that there are more ways than one to sell an electric percolator—or of meeting the needs of a customer, however strange.

PREPARING FOR TROUBLE is like carrying an umbrella on a threatening day—it generally

WIRING DIAGRAM



The front and back side of the tag which is attached to every water heater before it leaves the factory



CIRCULATION WATER HEATERS AND IMMERSION UNITS

TO INSTALL: Follow diagram on the back of this tag. No special pipe fittings are required; service cocks are recommended, being better than valves, since they are not easily tampered with. The lower service cock at the bottom of the tank should be set to restrict the flow of water, thus producing hotter water at the top of the tank than could otherwise be obtained (90° C. or 194° F.).

TO OPERATE: Connect to cooking or power circuit of voltage stamped on name plate. A thirty or forty gallon tank is the usual size for use with our larger intermittent heaters, while the smaller, continuous heaters are for use on a storage circulation system or with the smaller eighteen-gallon tanks. To obtain economical operation and reduce current bill to a minimum, cover the tank and hot water pipe with a heat-insulating jacket; this will increase the efficiency approximately forty per cent and pay for itself.

THERMOSTAT CONTROL: Special space has been provided on the heater under the connection box to allow for the installation of an automatic thermostat switch. This switch will keep the water in the tank at a fixed temperature, plus or minus 5°. This insures hot water at all times, protects the tank from overheating and prevents the use of any unnecessary current other than that required to keep the water in the tank at the fixed temperature. Write for copy of our Water Heater Bulletin (Form 446).

EDISON ELECTRIC APPLIANCE CO., Inc.
NEW YORK CHICAGO ONTARIO, CAL.
W3P16

be connected and how it will look set up and the details of the wiring for the three types of apparatus. The other side gives full directions as to how to install and how to operate, with special directions on the thermostat control. This tag is supposed not to be thrown away but to be kept for convenient reference should any question arise at a later date. A suggestion is made at the bottom that the special bulletin on this subject be sent for.

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule IX. Unless specifically provided for in the contract, an extra charge will be made for any special finish or variation from the standard materials. By "standard materials" is meant standard material as regularly listed by the manufacturer whose product is specified.

THE CONVENIENCE OUTLET QUESTION

(Of course every householder should be liberally supplied with convenience outlets—but they are not. Old houses sometimes present difficulties of a mechanical nature—and new houses need greater cooperation between contractor and architect. The problem was discussed from its various angles at a recent meeting of the San Francisco Electrical Development League, from which two papers are here presented.—The Editor.)

HOUSEWIRING FROM THE MANUFACTURER'S STANDPOINT

BY E. N. BROWN

In a letter that I recently received from the Heating Appliance section of the Associated Manufacturers of Electrical Supplies they stated that the war had advanced the electrical business at least 20 years. If this statement be true and we do not get a hustle on ourselves we are going to be 20 years behind before we know it.

There were \$10,000,000 worth of heating appliances sold in the year 1918, and in actual volume the production of 1918 was in the neighborhood of twice the production of 1914. This demonstrates the fact that it is necessary for us to take measures for house wiring, not only to meet the advancement up to the present date but that of the future. I am frank to state that in this connection I believe the matter lies almost wholly in the hands of the architects, builders, electrical contractors and power companies.

I think it very commendable on the part of the Chief of the Department of Electricity to wish to take up the matter of house wiring at this time at a meeting such as this, where it comes before those so vitally interested.

I am only a manufacturer and can only offer a few suggestions: I think the wire to the wall outlet should be handled by those I have previously mentioned and I do not want to make any suggestions on that end of it, as those branches mentioned should be fully capable of handling the situation, but I would suggest that the wire from the wall outlet to socket fixture should be increased to No. 14 as a minimum, and I also think that the fixture should have plug outlets independent of light outlets—this is now being practiced universally in New Zealand and in such a manner that it has proved entirely satisfactory over there. I received this information from our New Zealand agents.

I also think that each room should have a base board receptacle,—I think this should include the kitchen as well as other rooms, as we have to figure on electrical ranges in the future, and where they are used we will want to use air heaters for warmth or fans for cooling, as the case may be, in addition to irons, etc.

I understand the object of this meeting is for a discussion of how to prevent fire hazard as well as discussing house wiring, and if I am correct I want to suggest two matters so they may come before your notice. The first is that there are a great many clerks in stores who are order takers and not salesmen. These clerks oftentimes make errors that should not be made and for which the public blame the electrical business in general. I think this can be partially overcome by the good work the Califor-

nia Electrical Cooperative Campaign managers are now doing. Educate the clerk and let him help educate the public.

Secondly, I wish to call before your notice the fact that a great many devices are being placed on the market that seem to be manufactured for cheapness, and these devices have caused trouble and will cause trouble as long as the main object of the manufacturer is to see how cheap he can make an article for the trade. The dealer can overcome this matter to a great extent by buying quality goods. There are also a great many articles on the market that are not approved by the underwriters, and which should be approved before being marketed. If the dealers would only take the trouble to find out if these articles are approved by the underwriters they would help the electrical business a great deal. I think in this connection that the fault lies mostly with the dealer, as the manufacturer would certainly be forced to put out an article which was approved by the underwriters if the dealers demanded it. In all these matters any company stands only too willing to cooperate and assist in any way it is called upon, both with its advertising and its engineering force.

THE BASE RECEPTACLE AND THE CONTRACTOR-DEALER

BY W. D. KOHLWEY

The electrical dealer is greatly interested in the sale of appliances (and I am going to leave out the word "lamp socket appliances," for reasons that will follow in proper routine). The sale of appliances swells the daily receipts, and the total of these receipts really classifies the dealer.

Our slogan to buy electric appliances from the electrical dealer has a real and sincere purpose back of it; we want to see these appliances used under the most favorable conditions so that the users can get the very best results with the least effort—for the satisfied customer is the real asset of any business. The electrical business with us is not a side line as it is with the department, hardware, and drug store. With them, if the appliance does not give satisfaction, gas, coal oil, or alcohol is recommended, and things electrical are given another setback.

Unfortunately, about 90% of appliances are not used under favorable conditions—connections are makeshifts, floor and base board plugs are missing. Of course we know why they are missing. The campaign of the Society for Electrical Development for the extra outlet was one of the best things ever done by them. We need that extra outlet—and then some more—for the toaster, the iron, the vacuum cleaner, the piano lamp—and moreover, let's not forget the heater. Now, if we can get the order to install these plugs, can we do so and stay within

the rules of the Department of Electricity? Seldom, for as a rule houses are wired for lighting only and the service is not heavy enough. Oftentimes a larger wire could be pulled in, but again we are up against the proper sizes of conduit. To put in an entire new service would entail too great expense—so the work is left undone and appliances are used under adverse conditions and under greater hazards. However, the Department often grants special permission in cases where an installation can be improved by not following altogether the very word of the rules and code. How far the Department will go, of course, I don't know—there are so many shoemakers and locksmiths in the electrical business that it isn't wise to grant too great a leeway.

APPLICATIONS OF ELECTROPLATING

Electroplating is an art which has been developed during the last 50 years with only occasional applications of scientific principles. Formerly the industry was much shrouded in mystery, each plater guarding jealously the formulas and methods employed by him. Of recent years, however, there has been a considerable demand from electroplaters and manufacturers for more exact data relating to this industry.

This need and demand for information has been emphasized during the war by the numerous problems that have arisen in connection with the plating of military supplies of the most varied description. Thus, zinc plating has furnished an excellent and, in

many cases, the best protection against the corrosion of steel parts, such as airplane and seaplane fittings, fuse parts, hardware on ammunition boxes, etc. Black nickel plating was very extensively used for producing the so-called "government bronze" finish upon brass hardware and saddlery equipment. Lead plating proved valuable in the lining of gas shells and for bringing up to standard weight shells which were under weight. In connection with these problems a number of investigations were conducted at the Bureau of Standards, whose experts made frequent visits to munition plants to advise upon the best methods of securing the desired results.

Appropriations have been requested by the Department of Commerce to permit more exhaustive study by the Bureau of Standards of plating problems and their application to various manufacturing industries. Electroplating forms an excellent illustration of a "key industry," i. e., an industry which, while it is not itself of great magnitude, is often of fundamental importance to larger industries. Thus, electroplating is essential to the manufacture of tools, builders' and saddlery hardware, plumbers' supplies, gas and electrical appliances, automobiles, silverware, jewelry, stoves, household utensils, mechanical devices such as phonographs, cash registers, sewing machines, adding machines, typewriters, cameras and other optical and scientific instruments, and, in fact, almost every industry in which finished metal articles of any description are produced. Progress in the art of electroplating will bring about corresponding improvements in all such industries.

BRINGING THE SAFETY MESSAGE HOME

A little informality in the Safety Bulletin is more likely to make it remembered. The accompanying picture is a reduction from a poster issued by the Northern Pacific District, United States Shipping Board, in their campaign for accident prevention. As reported by the California Safety News, there is now about one accident to every three men employed in ship-yards. By effective methods of prevention this may be reduced to a fair average of one to every eight men employed. The poster, which really carries its point, is one means of achieving this end. The Gary Works of the Illinois Steel Company has hit upon a similar scheme in connection with its works. It was noted that the Safety bulletin boards were failing to attract attention and so pictures were combined with chalk sketches and comments.

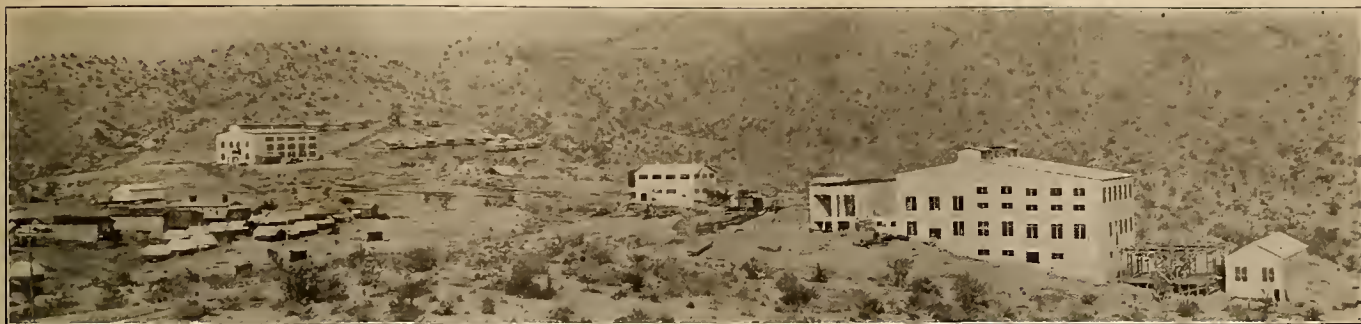
Various posters were secured illustrating patriotic subjects, matters of public interest and advantages of safety. These posters were arranged on boards with some catchy phrase printed with chalk. This plan proved its value by the renewed interest taken in the material posted.

don't venture into "NO MAN'S LAND"

<p>MAN STARTS BORING HOLE THRU BOTTOM OF SHIP—</p> 	<p>WITH POWER DRIVEN BORING MACHINE BUY EASY SEE WHERE DRILL IS COMING THRU</p> 	<p>INSIDE OF SHIP ANOTHER MAN STANDS RIGHT OVER PLACE WHERE</p> 	<p>DRILL COMES THRU INTO HIS FOOT.</p> 
<p>ANOTHER WORKMAN BORING THRU THE SIDE STRIKES MAN IN BACK—</p> 	<p>CAUSING ANOTHER BAD ACCIDENT.</p> 	<p>BECAUSE THE NOISE OF THE MACHINE CANNOT BE HEARD THRU THIS THICK WOOD</p> <p style="text-align: center;">And so—</p> 	<p>THE MEN WITH THE "WHITE CAPS" "THE SAFETY FIRST MEN"</p> 
<p>PROVIDE LONG TAPERED STICKS</p> 	<p>PAINTED RED ON THE SMALLEST END—</p> 	<p>TO BE THRU THRU HOLES JUST NEWLY BORED</p> 	<p>TO WARN ALL MEN</p> 
<p>THAT OTHER HOLES ARE BEING BORED "RIGHT NEAR"</p> 	<p>AND BE WITHIN FIVE FEET OF THIS FLAG STICK IS "NO MAN'S LAND"</p> 	<p>"SO HELP THESE 'SAFETY FIRST MEN' MAKE THINGS SAFE FOR YOU BY TELLING THEM OR WARE THINGS AND PLACES AND IF YOU NEED SOME OF THESE</p> 	<p>FLAG STICKS ASK THE MEN WITH THE WHITE CAPS.</p> 

REMEMBER

"SAFETY FIRST"

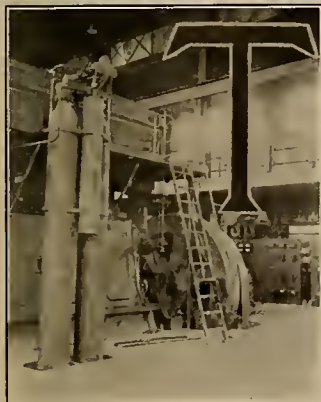


Panorama of mine, showing the filter building at the extreme left, the settling tanks, mill building, main ore bin, main warehouse and power house, with the Mexican and white man's villages in separate localities as indicated.

ELECTRIC GENERATION BY DIESEL ENGINE

BY E. J. RICHARDS

(There has been much talk of the use of the Diesel engine to generate electricity for use in mines—but up to now no actual application in the West. This description of the successful generation of electricity by Diesel engine for the operation of a large copper mine in Arizona will therefore prove of particular interest. The author was formerly chief electrical engineer of the Arizona Hercules Copper Company and had entire charge of this installation and its early operation.—The Editor.)



Interior of the power house, showing the enormous bottles for compressed air used for "cranking up" the Diesel engines.

THE property of the Hercules Copper Company is situated in Pinal county, Arizona. It is a copper producing property with its mines located at Ray and its concentration mill and power plant located six miles distant at the town of Kelvin. The reason for this separation is the availability of water at Kelvin, located on the Gila river, needed in the milling process, and a suitable topographical location

for the disposal of "tailings" or waste material resulting from the milling process.

Steam vs. Diesel Engine

During the early days of the development of this property very careful and serious consideration was given to the question of power supply. Electrical distribution was determined upon early in the investigation and the relative merits of steam vs. Diesel engines were carefully analyzed, due weight being given to the matter of coal supply, price and quality, as against fuel oil from the Southern California oil fields.

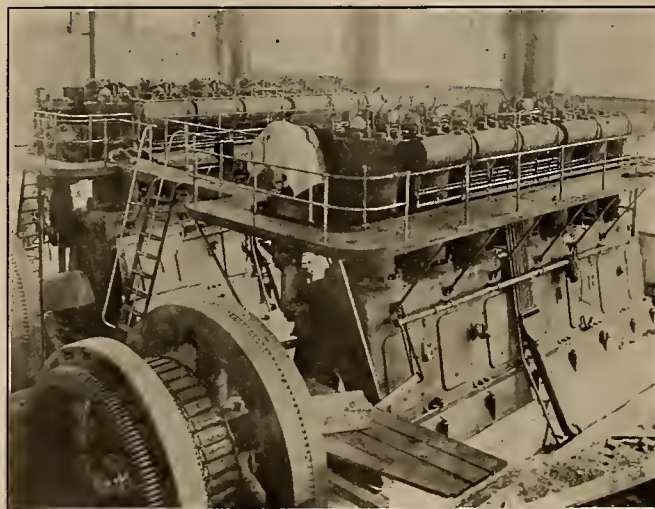
After an extended study of all the factors entering into this particular situation, Diesel engines were decided upon and an inspection of various Diesel engine plants operating in the Southwest led to the adoption of the engine manufactured by the McIntosh and Seymour Corporation. It was felt that this engine possessed superior features for this work and was manufactured in sizes best suited to the probable load conditions to be expected in the operation of this mine.

Details of Installation

The power house was designed and foundations provided for four units of a nominal rating of 1045

h.p. each, three units being installed as an initial equipment. The engines are of the six cylinder, four cycle type with cylinder dimensions of 22 inches diameter by 32 inches stroke at 164 revolutions, each unit occupying a floor space of approximately 46 feet by 14 feet, with a maximum height of 17 feet above the floor line. The total weight of each unit complete is approximately 42,500 pounds.

The guaranteed fuel consumption of these engines was .67 pounds per kw-hr. at the switchboard on fuel oil of a heating value of 18,500 B.t.u. As a matter of fact, this guarantee was materially bettered on a preliminary test run using 14 gravity oil from the Bakersfield oil fields.



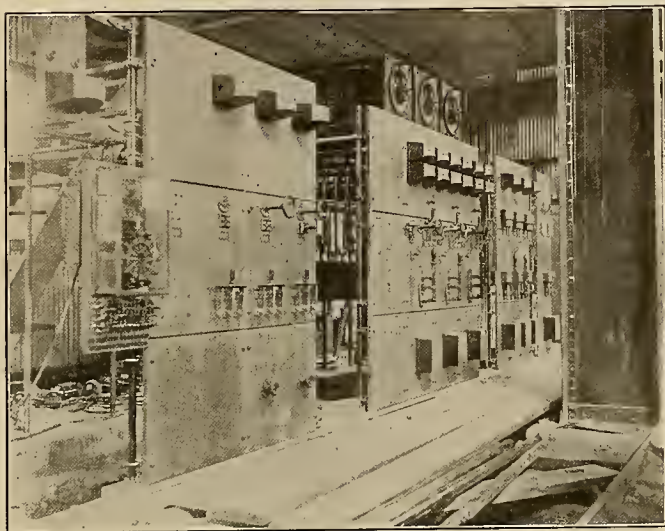
POWER PLANT INTERIOR

The Diesel engines installed.—The power house provides foundations for four units of 1045 h.p. each, three units being installed as an initial equipment.

Each engine unit is directly connected to a 900 kva., 3 phase, 60 cycle, 2300 volt generator with 125 volt overhung exciter on the end of the main engine shaft. A suitable standard switchboard is provided, in a switchboard bay, consisting of four generator panels, a Tirrell regulator panel, a transmission line panel, two mill feeder panels and one pump line panel for a line to the pumping plant at the river. The

transmission line panel supplies the primary side of three 500 kva. water cooled transformers, 2300/4400 volts—with one spare unit—supplying energy to the transmission line leading to the mine, six miles distant.

The power house building is a steel frame structure, size 60 by 120 feet, covered with corrugated iron with wood roof on steel trusses and covered with asbestos prepared roofing. The building is served with a 15 ton hand operated crane.



SWITCHBOARD PANELS

The power house switchboard of four generator panels. A Tirrell regulator panel, two mill feeder panels, and one each for the transmission line and pump line.

A 50,000 gallon steel tank located about 500 feet distant and at an elevation of about 50 feet above the power house floor furnishes a supply of cooling water for the jackets of the engine cylinders, with a concrete spray pond, about 50 by 50 feet and 6 feet deep, furnishing a reservoir in which the water is normally cooled by spray nozzles and circulated through the cooling system. A duplicate set of motor driven centrifugal pumps, located in the power house, circulates this water through the cooling system or returns it to the steel storage tank, as required.

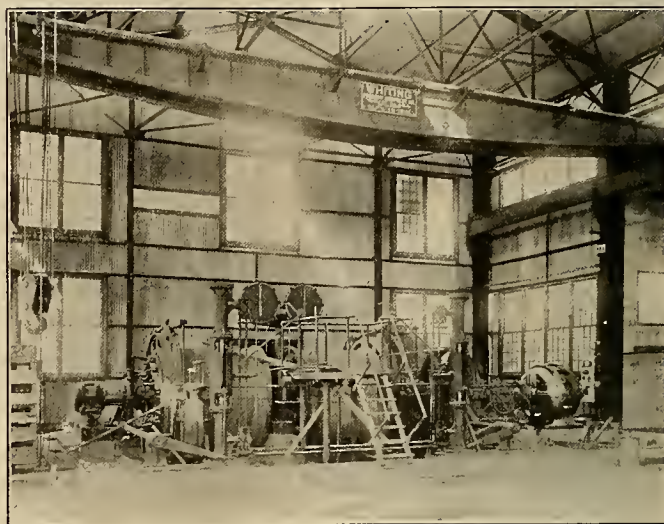
Two 40,000 gallon steel oil storage tanks are provided and located about 500 feet from the power house at an elevation slightly below the power house floor but at such an elevation as to permit unloading tank cars, by gravity, from the main railroad spur leading to the mill. Oil is pumped to 500 gallon "daily" storage tanks above each engine, by means of electrically operated triplex plunger pumps located at the main storage tanks and operated by means of switches in the power house.

Transmission Line

The transmission line between the power house and mine is located along the east bank of Mineral Creek and runs in practically a direct line between the two termini, on private right of way. The poles are of expanded steel spaced about 15 to the mile with 13 anchor towers at selected points along the line. As the line traverses a mountainous country, composed almost entirely of rock, practically all holes

had to be blasted, and the footings of all poles were set in concrete.

Owing to the rugged and inaccessible character of the country all material, including poles in sections, pins, insulators, cement, gravel and even water for mixing concrete had to be transported by burros to the site of each pole.



HOIST AND COMPRESSOR HOUSE

The motor which furnishes the power for operating the Nordberg hoist is shown at the right.

The main power conductors are $\frac{3}{8}$ in. Siemens Martin seven strand steel cables, with a $\frac{5}{16}$ in. similar steel cable above these as a ground wire and two $\frac{1}{4}$ in. similar steel cables below the main conductors for private telephone service. Lighting protection is furnished by means of outdoor type horn gap arresters at each end of the line and air break switches on the terminal pole at each end of the line constitute the only switching arrangements on the high tension side of the line.

44,000 volt pin type porcelain insulators are used on all single piles with three disc insulators in series at each anchor tower.

Mine Equipment

The mine substation is located in what is known as the Compressor or Hoist House, a steel frame, corrugated iron covered structure, and includes three 500 kva. water cooled transformers, with one spare, similar in all respects to those at the power house. Taps are provided on all transformers for necessary adjustment of voltage. The secondary voltage at the substation is 2300 volts and nine switchboard panels give control of the various circuits at the mine, each panel being provided with an integrating wattmeter for recording the energy used in the various stages of the mining operations.

In the building housing the mine substation equipment is also located the main mine hoist, a double drum, counterbalanced hoist with a rope speed of 1000 feet per minute, directly driven by a 400 h.p. 2300 volt slip ring type induction motor with speed control furnished by means of a liquid rheostat. Here is also located a 3000 cu. ft. two stage air compressor driven by a 518 h.p. synchronous motor; two 100 kw. motor-generator sets for underground trol-

ley haulage and the necessary motor driven pumps for handling auxiliary cooling water supply for compressor and transformers and oil pumps for operating brakes, clutches, etc., on the main hoist.

Other motor drives at the mine include a 150 h.p. motor in the crusher plant driving a gyratory crusher and set of Traylor rolls; a 40 h.p. motor operating a 36 in. horizontal belt conveyor from the crushing plant to the main 5000 ton ore storage bin and the sample mill equipment; a 20 h.p. motor operating a horizontal belt conveyor over the ore storage bin; a 50 h.p. motor driving the machine tools, etc., in the machine and blacksmith shop, and a 10 h.p. motor driving a saw mill in the timber framing shed. All of these motors are located on the surface and all motors of 20 h.p. and over are wound for 2300 volts.

Underground on the first level, at a depth of approximately 500 feet, are located two 4 stage centrifugal pumps directly driven by 50 h.p. motors at 440 volts and used for pumping mine water to the surface. One unit is held as a spare. A similar pump but of larger capacity has been arranged for the second level, at approximately 1000 feet depth, driven by a 125 h.p. 440 volt motor.

The main underground haulage levels are served by an overhead trolley system in which 4-ton locomotives are arranged to handle trains of not to exceed 38 cu. ft. ore cars. These locomotives are each equipped with two 11 h.p. 125 volt d.c. motors with series-parallel control. The adoption of this low voltage is practically an innovation in the copper mining industry as it has been found that 220 volts has proven fatal to life under conditions found in copper mines. These 125 volt locomotives operate with entire success.

Mill Equipment

At the mill are located 3 Marcy mills each driven, by means of spur gearing, by a 225 h.p. slip ring variable speed motor. Three sets of horizontal belt conveyor, each driven by a 10 h.p. motor, handle the ore from the mill storage bin to the Marcy mills.

Three Harding mills for fine grinding are directly driven by 50 h.p. slip ring variable speed motors. Two pressure blowers for the flotation system are driven by 200 h.p. induction motors. A 60-ton electrically operated crane in the grinding room is supplied with direct current by a 75 kw. motor generator set. Three sets of pulp distributors together with pulp elevators for the flotation system are driven by three 20 h.p. motors. Overstrom tables are driven by a 40 h.p. motor.

The machine and blacksmith shop at the mill is operated by a 50 h.p. motor. Sundry tailings pumps, concentrate conveyors, etc., are driven by various small motors in sizes from $7\frac{1}{2}$ to 10 h.p. As in the mine installation, all motors at the mill of 20 h.p. or over are wound for 2300 volts.

Energy for the mill installation is supplied from the power house over a line of steel pole construction carrying two bare stranded copper circuits of No. 4/0 wire with reserve space for additional circuits for future mill extensions.

The filter plant is operated by a 50 h.p. motor and in this plant are also located two centrifugal direct driven return water pumps each driven by a 25 h.p. motor.

Pumping Plant

At the mill pumping plant, located on the banks of the Gila river, are located two quintuplex plunger pumps, each driven by a 200 h.p. two speed motor; each pump having an approximate capacity of 500 or 1000 gallons per minute depending on its speed. The pumping plant is supplied with energy by a wooden pole line from the power house carrying a single circuit of No. 0 bare stranded copper wire.

The power house operations have been successful and the result of the first month's operations with an extremely low load factor and with full power house operating crew gave a resulting cost of approximately nine mills per kw-hr. at the switchboard, although this figure will be materially lowered when full load conditions are obtained.

HOW MANY ENGINEERS ARE THERE IN AMERICA?

In Prof. Charles R. Mann's report on engineering education it is stated that up to 1870 the total number of graduates of all the engineering schools in America was 866, and that there were only 7,274 practicing engineers in 1870. Up to 1915 the total number of engineering graduates was 55,000, but 39,999 of these graduated subsequent to 1880. Prof. Mann estimates that there are 80,000 men who could qualify for membership in the four great national engineering societies, and that about 40,000 are graduates. We regard the 80,000 as an underestimate, for the census of 1910 indicates that there were more than that number eight years ago. The 1910 census shows:

Mining engineers.....	14,514
Mining engineers	6,930
Civil engineers and surveyors.....	52,033
Electricians and electrical engineers	135,519
Draftsmen	33,314

Although many of the draftsmen and surveyors could not qualify as engineers, and although almost none of the "electricians" could so qualify, it seems evident that fully 100,000 men could have qualified as engineers in 1910.

The total number of engineers recorded in the census doubled between 1890 and 1900, and it more than doubled between 1900 and 1910. There is reason to believe that the increase during the past eight years has been fully 50 per cent, for in the 10 years of 1901-1910 the engineering graduates numbered 21,000 as compared with 17,000 in the six years of 1911-1915.

It is the belief of Engineering and Contracting from which the brief survey here given is quoted, that there are now fully 150,000 Americans who can qualify as engineers. The total membership in all the societies having headquarters in the Engineering Societies building in New York is 53,000, of whom about 30,000 are members of the four great national engineering societies.

UNIFORM FILING SYSTEM

BY C. C. HOGAN

(A unique system of filing which has been adapted from the Dewey decimal system to meet the particular needs of a large power company. The data is of interest to anyone handling electrical and engineering subject matter of any kind from a company library of books and pamphlets to correspondence. The actual subjects and subdivisions in use by the Southern Sierras Power Company will be given in the next issue of the Journal of Electricity.—The Editor.)

In common with all other public service corporations, the need of a satisfactory system of filing has been one of the problems incidental to our development and growth. The problem has existed for years, but has never been completely solved.

Shortly after our entrance into the Southern California territory and the removal of our operating headquarters to Los Angeles, it was apparent that our business and operations were to assume large proportions,—that there would be a variety of businesses managed from our California headquarters in addition to the primary industry of generating and distributing electricity. Thus we soon found ourselves engaged in the manufacture of ice, in the operation of a telephone and telegraph system, a railroad and a water and irrigation system. Incidental to such multitudinous and varied operations, and the incorporation, acquirement and financing of the several companies as the mediums through which they must needs be conducted, there necessarily developed an enormous correspondence, much of which is of vital importance from a legal and an historical standpoint. The preservation of these records in such a manner as to render them readily available was a problem which presented great difficulties for several reasons, a few of which I will state.

Familiar Filing Systems Unsatisfactory

First, the bulk of the correspondence was between a limited group of people, viz.: our officers and directors, department heads and superintendents; with the exception of letters to and from our bankers, government officials and customers (in the aggregate a small percentage of the whole), practically all of our correspondence is inter-office or inter-departmental. Consequently, the ordinary alphabetic system would not suffice. For instance, correspondence with our secretary, Mr. Fisher, if filed alphabetically under "F" would soon accumulate into a mass of miscellaneous and unclassified papers that would render the location of particular documents difficult if not impossible. This objection to the alphabetic systems applies to, I should judge, 90% of our files.

Second, it was not possible to file geographically, that is, by office or stations, for the same reason. If all correspondence with the El Centro office, for example, was filed under El Centro, it would soon resemble a paper factory hit by a German shell.

Third, the use of the ordinary numerical system by which subjects are numbered and indexed in numerical sequence as they arise, while perhaps containing many advantages over the alphabetic or geographic system, nevertheless presented these objections: The duplication of subjects could not be avoided, as the same subjects would be designated by different names, so that the index would not disclose a possible duplication; and, the keeping up of

an elaborate index would, in itself, require labor and expertness that could not be expected of the ever-changing force of clerks employed to do this work.

The Dewey Decimal System

Having eliminated the Alphabetic, Geographic and Numerical-Subject Index system of filing, we did not thereby conjure away the pressing problem before us. Our business was growing, our papers were accumulating and must be classified and filed in some way. After considerable discussion the suggestion floated in from somewhere to try the Dewey Decimal System. But while the Dewey Decimal System of numbering subjects was the ideal one for subdividing, there was apparently no classification or compilation of subjects which covered our particular line of business. The original Dewey Decimal System was applied to library work, and is still the basis of the Standard Library Classification. The Bell Telephone System also had worked out a telephone subject classification, and a Mr. Williams had compiled a railroad classification on the decimal plan. About the time I tackled the job or shortly thereafter the Journal of Electricity, I believe, did publish in full a classification designed for the Electric Light and Power business, but a careful study of all classifications then available disclosed the fact that they were either not applicable to our business as a whole, or else were rather loosely thrown together without an orderly and uniform segregation of subjects.

I became thoroughly convinced that the decimal system of numbering was superior to any other arrangement, for two main reasons, i. e., it permitted of designating subjects by definite numbers which could be forever retained in a fixed relation to all other subjects, and it provided a means of unlimited subdivisions without destroying the fixed relation of the primary subjects. It follows that when a subject was once predetermined its name and number would always remain the same, and the repeated use of the subject, name and number would add immensely to its mnemonic value and avoid any possibility of useless duplications.

The problem then was to build up a full-fledged, red-blooded subject body upon the decimal-numerical skeleton, and this for a time was a poser, for no serious attempt had theretofore been made to designate our correspondence by subjects.

My task was, first, to collect and compile a list of every conceivable subject with which we were likely to deal; second, to group such subjects in uniform and orderly relation to each other.

Collection and Classification of Subjects

To accomplish the first task, that of collecting subject names, I had access to all the companies' files since we commenced business; current correspondence was carefully analyzed and a circular letter

was sent to all department heads and superintendents, requesting them to submit lists of subjects with which they dealt. No attempt was made to suggest names for their subjects, as it was thought that whatever names they might hit upon would perhaps indicate the terms more commonly used. About six months was required to collect, analyze and list the subjects. This called for careful work to avoid duplications and to determine upon subject names that would correspond to subject-matter.

After the list of subjects was compiled in this manner, the second task, that of segregation, was undertaken, and of the two, this was by far the most important. It is easy enough to scramble eggs, but not so easy to reverse the operation. The difficulty of arranging an orderly segregation of the subjects is illustrated by the fact that our present classification is the result of four revisions in the arrangement of primary subjects.

First, I wanted the complete classification to be a reflection of our business,—so that by reference to it we would there find reproduced by appropriate name, every act or thing which goes to make up our system and business. I pondered upon this deep and long, for to make my automaton function and serve—to make the classification workable and useful, was a “consummation devoutly to be wished.” In arranging the position of my subjects, it occurred to me to follow in logical sequence our own business growth. If the Classification was to be a true, undistorted reflection of our business, why not begin at the beginning, that is, the organization and incorporation of our companies, and then arrange the subjects representing our various stages of development in their logical sequence?

This, in short, is the groundwork plan of the classification, for eliminating the “General” Division, the main Divisions follow our development in regular sequence, Administration (including organization-incorporation), Engineering (Construction), Operating, Finance & Accounts, Properties, Public Service. It is intended to comprehend every activity connected with our business from the time it is organized until it is a “going concern.” Between those two extremes is found a suitable place for every subject which may arise.

Original Features

An original feature of our system, to be found, I believe, in no other Classification, is that a definite function or scope is assigned to each Division. Administration, as the word itself signifies, comprehends in addition to organization, all managerial functions—the division and exercise of authority from the stockholders down to the humblest employes.

Likewise, the next Division—Engineering, embraces definite functions—Surveying, Construction, Maintenance, Dismantling.

So on, down through the remaining divisions, definite duties are assigned to each. These are readily distinguishable in practice, and easily memorized so that in filing or locating correspondence, by a rapid mental process of elimination the subject is readily narrowed down to its proper Division.

The advantages of this arrangement are very pronounced in practice, but difficult to put into words. The subject names appearing in the Divisions of Engineering, Operating and Properties, consist for the most part of things, or nouns; the functions assigned to the Divisions indicate what is done with the nouns—in short, supply a verb. The effect of this is that by placing a subject or thing in either Division it becomes clothed with the virtues of that Division—in other words, the particular activity concerning the subject is indicated. For instance, the subject of Water Wheels, if 231.310 in Engineering Division would mean that anything concerning the construction, repair or dismantling of a water wheel would be so numbered. If in 331.310, Operating Division, it would concern the operation of the apparatus; if in 531.310, it would concern the Purchase, Rental or Sale of a Water Wheel. By this automatic combination of nouns and verbs we avoid unnecessary duplication of subjects. In the instance cited, under the ordinary method a separate subject would have to be given:

Construction of Water Wheels
Repairs to Water Wheels
Dismantling of Water Wheels
Operation of Water Wheels
Purchase of Water Wheels
Rental of Water Wheels
Sale of Water Wheels

At least seven separate subjects, whereas our plan requires but three.

The Principle of Subdivision

It was then in order to fill in the intervening spaces—to give substance and contour to the body that it may be both pleasing to the eye and useful in service. To build up a classification from the materials at hand that would comprehend every class of business involved and every phase of each class.

It will be noticed that the seven main Divisions were assigned the hundreds series. The next subdivision is, of course, the tens. With few exceptions, which it is unnecessary to here explain, each of the tens was assigned a class or kind of business in which we are engaged, such as 30. Electric, 40. Railway, 50. Gas, 70. Heating, 80. Water. (A complete classification for Gas and Heating is compiled and given its place ready for use later on should we perchance engage in this kind of business.)

Another unique and original feature of the classification is the uniformity observed in assigning identical sub-numbers to the different classes of business in each of the main divisions. This is a great aid to memory, for once the sub-number is memorized, you can confidently locate it in any appropriate main division by using the proper “Hundred.” The subject “Substations” (37.) is 237. in Engineering, 337. in Operating, 537. in Properties. This uniformity in numbering is maintained throughout the entire classification, and has proven to be an invaluable aid in actual practice.

Having segregated our business, first, into seven main divisions or groups, second, into the various classes of business, it remained to then combine within each class all the subjects pertaining thereto. Each class, except in general matters affecting all

alike, stands on its own bottom and is complete in itself. Each organ of our imaginary man performs its proper function and occupies its predetermined place.

It is unnecessary to go further in explanation of the subject grouping, for it will be obvious, having followed me thus far, that minor subjects pertaining to each class are simply sub-divisions of that class, the appending of the required number of decimal figures being resorted to to designate each minor subject by a fixed number so that its position in the classification never changes.

I may say, however, that in arranging the minor subjects, the same method was followed in grouping them in their regular and logical sequence. For instance, in the Electric group, we started at our Generating Plants, then placed Transmission Lines, Distribution Lines, Sub-Stations, and Customers' Installations, each in regular order. This same treatment of minor subjects is followed throughout all Divisions of the Classification, so that in locating a subject the habit is soon acquired of finding it where it naturally belongs with relation to other subjects.

Self-Indexing Card System

The third original feature and the one most important and useful in practice, is the self-indexing card system worked out for the complete classification. The self-indexing feature is followed out to some extent by the use of tabs in the condensed Classification Booklet for the use of local offices. This scheme of self-indexing does away entirely with the elaborate alphabetic index to subjects commonly used with the decimal system, and permits of the almost instantaneous location of a given subject.

Can Be Combined with Other Systems

I desire also to point out that notwithstanding all subjects are given a definite and permanent number, this does not prevent an alphabetic, geographic or other special sub-division of those subjects when circumstances require. This is a purely mechanical arrangement in no way detracting from the original principle of our filing system. It makes possible a combination of the numerical, alphabetic and geographic systems. For instance, if the subject 638., Irrigation Service, becomes too bulky, an A-Z Folder for alphabetic sub-division is used for this subject so that correspondence concerning each customer can be filed alphabetically but will always, by the governing number 638., be kept in its proper position in the files.

SAFETY FIRST

BY C. R. HILL

(The recent agitation of the safety question in the West with a view to legislation along these lines has made the following statistics of special interest. The data formed part of a paper presented before the Nevada Section of the N. E. L. A. The author is with the University of Nevada.—The Editor.)

As in the case of many other movements affecting human life and welfare, the movement for industrial safety and the prevention of accidents may be summed up in a sentence: 'The best safety device is a careful worker.' An examination of the statistics

of industrial accidents that have been compiled in recent years demonstrates that the greatest number of accidents common to all industries are due not so much to dangerous machines or the absence of safeguards on machinery, but are due to the following simple causes:

Falling and slipping down stairs; falling on slippery floors; falling into open and unguarded pits or manholes; falling from unsafe ladders, stagings and scaffolds; the falling of objects, tools, and materials from overhead work places on fellow workers below; straining to lift too heavy loads, or unscientific methods of handling loads and materials; the careless use of hand tools; lack of protection against flying materials from tools and material that are being worked; projecting nails; removal of safeguards or the neglect to use the safety appliance provided; oiling machinery in motion; improper clothing; poor lighting of shops and work places; lack of good inspection, and carelessness on the part of the workers themselves.

Practical means of educating workers for co-operation in industrial safety are: Instruction in the causes of accidents, and the prompt discipline of workers found guilty of dangerous practices; organization of safety committees, especially of workmen's committees, to visit various departments of the industrial plant, to study the causes of accidents and to suggest ways and means of preventing such accidents in the future; the posting of bulletin boards of material calculated to impress the causes of the accidents, and personal responsibility in preventing them, upon the minds of the employees; the dissemination of safety information by means of leaflets, placards, and terse slogans on the pay envelopes; prizes for safety suggestions and accident prevention records; stimulating competition among employees and their cooperation with the management; motion pictures, lectures, safety rallies, in which the causes of the accidents and the methods of prevention are visualized, explained, and made practical by discussions based on personal experience. The results of two companies who have conducted safety first campaigns, similar to that just described, among their employees are as follows:

GENERAL ELECTRIC COMPANY			
Pittsfield Works			
Year	No. of Employees	No. of Lost Time Accidents	Percentage of Employees Meeting with Accidents
1912	4913	1850	37.6
1913	5852	1353	23.1
1914	4385	573	13.05
1915	3904	353	9.04
1916	5378	721	13.4
Decrease from November, 1912, to 1916, 64 per cent.			
Schenectady Works			
Year	No. of Employees	No. of Lost Time Accidents	Percentage of Employees Meeting with Accidents
1913	19977	1284	0.64
1914	16823	829	0.49
1915	15347	662	0.43
1916	20985	1355	0.67

Note.—A "lost time accident" is one causing a loss of time of 5 hours or more.

Some interesting facts developed from their investigations:

The most careful age was found to be 37 years.

The ages showing the most accidents in proportion to number of employees were between 22 and 26, and 50 years and over.

The hour showing the most accidents was from 9 to 10 a.m.

Fifty per cent of the accidents occur to new employees, i. e., those who have been with the company less than six months.

Contrary to general belief, the foreign born employees are exceptionally quick in acquiring the safety habit—if taught.

More accidents occur on Monday than on any other day.
More accidents occur in the hot seasons than in the cold.
Eighty per cent of the accidents are due to carelessness.

A chart of lost time accident classification given herewith shows comparisons for three years made by Fred T. Ley, Inc., contractors (mostly buildings), of Springfield, Mass. Using 1915, when they started systematic and organized safety work as a basis, the reduction in accident rate per 1000 employes for 1916 was 25%, and for 1917 55%. The highest quarterly reduction was 80%—for July, August and September, 1917. By way of comparison, the accident cost reduction for 1916 was 53% and for 1917 was 66%. A chart reproduced shows the different classifications, the number of accidents per 1000 employes, and the percentage of reduction in each year for different causes. For the future they intend to add

four additional main causes and when the monthly compilation of this data shows any cause or causes running high in percentage they will have them subdivided for two or three months to locate the particular occupation requiring special attention.

PER CENT REDUCTION IN NUMBER OF LOST TIME ACCIDENTS
PER THOUSAND EMPLOYES SHOWN BY YEARS

Classification of Accidents.	1915 1st Year No.	1916 2nd Year No.	1916 per Red.	1917 3rd Year	1917 per Red.
Handling material	72	55	24	33	54
Falling material	63	35	44	16	75
Employes falling	61	43	30	28	54
Handling tools	32	28	12	13	59
Nails	80	71	11	42	47
Flying material	12	*21	75	9	25
Machines	24	9	62	6	75
Miscellaneous	55	41	25	33	40
Total average reduction			25		55

*Increase.
30% of the accidents was eliminated by mechanical safeguards.
70% of the accidents was eliminated through safety education.

EXPERIMENTING WITH THE ELECTRIC FURNACE

BY WIRT S. SCOTT

(The annealing treatment and the forging of steel have a new meaning in these days of giant shipbuilding activity throughout the great sea ports of the West. Here is an excellent discussion of the electric furnace and its applications to the steel industry that is unusually timely and instructive. The author is commercial engineer for the Westinghouse Electric and Manufacturing Company and one who has given much time and thought to this important subject.—The Editor.)

The purpose of this paper is to place before the electrical engineers who are engaged in the iron and steel industry certain facts relating to an electric forging furnace which the Westinghouse Electric and Manufacturing Company has been developing.

Our experimental work on resistor type furnaces for forging has continued through several years. Our first investigation was with a granular graphite resistor bed 9 inches wide, 8 inches deep, by 36 inches long, for heating a furnace having an opening 36 inches wide, 24 inches deep by 10 inches high. Other resistor materials and various combination of materials consisting of granular graphite, coke, charcoal, and finally these materials in various combinations, also in combination with carbon blocks, were given exhaustive tests, always with the same general result. It is sometimes of equal importance to know the reasons for failures as it is to know the reasons for success, hence it should be of interest to know the reasons for discarding all of the above resistor materials as being unsuitable for an electric forging furnace.

To secure even moderately successful results, it was found that resistor material must be of the purest carbon or graphite. It is quite difficult to obtain a supply sufficient for operating furnaces.

If there is any slag or ashes left from the combustion of the resistor, it remains in the bed, so that the relative proportion of such material is gradually increasing with time, causing an increase in the resistance of the furnace.

If the slag or ash is fusible at the temperature of the resistor bed, a clinker will be formed which very rapidly extends through the granular mass, resulting in a rapid increase in resistance and consequent failure to heat.

When the furnace was maintained for a considerable length of time at sufficiently high tempera-

ture to turn out heated steel at 1800° F., we found that the temperature in the bottom of the resistor bed exceeded the safe limits of refractory materials. With a temperature of 1800° F. on the surface of the bed, it was found that the temperature at the bottom was approximately 3600° F. This great temperature difference is due to the electrical characteristics of carbon in that it has a large negative temperature resistance coefficient, that is to say, as the temperature increases, the resistance decreases. It is evident that the carbon at the bottom or at the center of the bed will operate at higher temperatures than the surface, which has an opportunity to radiate its heat to the surrounding air and chamber. An increase in temperature at any given part lowers the resistance through that part, which in turn causes more current to flow, and so on, the temperature gradually increasing with the current. Conditions tend to become stable at any very high temperature, but greatly in excess of that which may be safely withstood by any refractory material now available.

In heating a piece of work in an ordinary fuel fired furnace, heat is transferred to the work by conduction from the hot gases and by radiation from the walls. The walls are maintained at a temperature higher than that desired at the work because they are continuously swept by the hot gases. In an electric furnace we do not have this action to heat all the surface uniformly. If heat is generated only on the floor of the hearth, the side walls and roof must obtain their heat by direct radiation. If cold pieces of metal are laid closely over the surface of the resistor hearth, they will interfere with the radiation of the heat to the walls and roof directly in proportion to the amount of hearth surface they cover. This would mean that the work would be heated from the under side only, and instead of

receiving heat from the walls and roof, it would be giving off heat, thereby always having a great difference in the temperature in the two opposite sides. In order to heat the upper surface to a sufficiently high temperature, the lower surface must be overheated.

During the latter part of 1916, we began our experiments in using carbide as a resistance material. A study of the chemical and physical properties of silicon carbide led us to believe that it possessed desirable qualities essential to a suitable resistor for an electric forging furnace, but also indicated that there were many difficulties to be overcome which were real problems in themselves.

The temperature of formation of this resistor is 1950° C. (2542° F.).

The temperature of decomposition is 2220° C. or 4018° F.

There is no oxidation of this material in pure oxygen at 1000° C. (1800° F.). From 1500° to 1800° C. (2375° F. to 3272° F.) oxidation is very retarded by the fused silica coating. Neutral or reducing gases, such as carbon monoxide, nitrogen and hydrogen have little or no action.

The hardness is between the ruby and the diamond.

Specific Gravity

The specific gravity is 3.12 to 3.20. Based on a specific gravity of 3.20 the weight of one solid block without pores is 199.7 lbs. per cu. ft., or .116 lbs. per cu. in.

Tensile Strength

In order to adapt silicon carbide to its various uses the tensile strength of the bonded articles may be made to vary between wide limits. In ceramic bonded articles where the bond does not introduce objectionable physical or chemical properties, a tensile strength of 1400 lbs. per square inch may be attained. A sacrifice of resistance to heat changes and chemical actions affecting ceramic articles must be expected with high tensile strength.

Electrical Conductivity

The resistor is a conductor of the second class. At ordinary temperature its conductivity is very low, being several times less than carbon. With increase of temperature its conductivity increases very rapidly, as it has a large negative temperature resistance coefficient.

The resistivity of the bricks varies with differences in porosity and chemical composition. However, it is interesting to note that at temperature above 1800° F. the resistivities have approximately the same value. A general idea of the variation of the resistance will be obtained from the following:

75 deg. Fahr.	50	ohms per cu. in.
1000 " "	18	" " " "
1800 " "	3.7	" " " "
2550 " "	0.65	" " " "

From a resume of the above, it may be seen that this resistor material possesses the following excellent qualities:

(1) The temperature of decomposition is above 4000° F., which is approximately 1500° higher than the hottest temperature required at the surface of

the resistor. Due to the construction of furnace employed, the atmosphere in the furnace chamber is non-oxidizing, and under these conditions the resistor is non-consuming.

(2) May be molded in block form, allowing the heating element to be placed in any desirable position around the heating chamber.

(3) Due to its high tensile strength, the roof of the heating chamber, as well as the hearth, may be made out of these resistor blocks.

(4) The fact that it has a large negative temperature resistance coefficient may be utilized in the control of the furnace temperature by controlling the current input to this resistor material.

The first complete furnace of this type which we built and gave promise of success had an outside dimension 41 inches wide across the front, 27 inches deep and 48 inches high. It was designed with two working chambers 7 inches long by 5 inches high, for the heating of 50 pounds of steel per hour to 1800° F. in each chamber, or a total of 100 pounds per hour for the furnace. The resistors consisted of blocks having a cross section of 4½ inches by 2½ inches passing above and below the working chamber. The resistors terminated in electrode chimneys filled with granular graphite, into which steel terminal plates extended, for external connections.

Owing to the high resistance of this type of furnace when cold, and due to the length of resistors used, a starting voltage of 220 volts was required, which was cut down in a few minutes' time to 110 volts, and then gradually reduced until 60 volts was reached, which maintained the proper temperature.

The time required to bring the furnace up to an operating temperature of 1800° F. was eight hours, starting with the furnace cold. Owing to the great heat reserve capacity of the furnace, the time required in successive heatings was greatly reduced, depending upon the length of time the furnace was out of operation. In order to have the furnace available for immediate use, sufficient current was maintained on the furnace during the nights to supply the radiation losses. On a 20 hour continuous forging test the average input was about 18 kw., or 300 amperes at 60 volts. The charge during this test consisted of approximately four pieces of steel weighing six pounds total, each piece requiring an average of three heats, one from cold to 1800° F., the other two from about 900° to a final temperature of 1800° F. The hourly output averaged 20 pounds heated from 70° to 1800° F. and 40 pounds from 900° to 1800° F.

No special attention was given to the thermal insulation of the furnace since that was of secondary importance, and a matter which could be taken care of at a later date, once we secured a suitable construction. Notwithstanding the light insulation that was used, a furnace efficiency of 41° was maintained. The furnace ultimately proved unsatisfactory due to unequal heating of the two chambers.

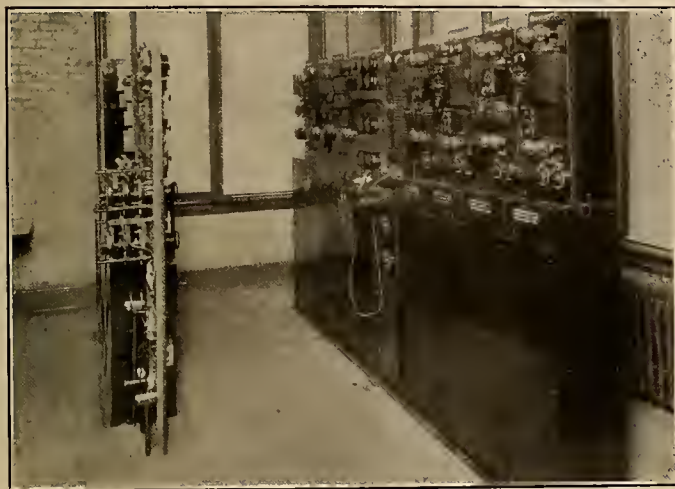
The results of the tests proved conclusively that a temperature of 1800° F. could be obtained and maintained for an indefinite period so far as the resistor material was concerned.

THE PRINCIPLE OF MULTIPLEX TELEPHONY

(The recently announced achievement of conducting five telephone conversations over one pair of wires is unquestionably the most important of the many advancements in telephony which the last few years have brought. The principles upon which this accomplishment has been based are here discussed in a non-technical way by the acting chief engineer of the American Telephone Company.—The Editor.)

Following is a part of the interesting statement of Bancroft Gherardi, acting chief engineer of the American Telephone and Telegraph Company, on the subject of the new multiplex telephony:

Before applying the new system, the pair chosen between Baltimore and Pittsburgh was operating as follows: In addition to carrying a telephone circuit of the usual type, each wire of the pair was



The apparatus at Tuxedo, just outside of Baltimore, used for connecting five Washington circuits to one Pittsburgh circuit

equipped with composites for duplex telegraph working, and, further, that portion of the circuit from Baltimore to Dallastown was combined with another pair into a phantom telephone circuit. Without disturbing the working of any of these arrangements, by means of our multiplex system we superimposed on the wires in question four additional telephone circuits, together with the complete signalling arrangements necessary to operate them. Both the talking and signalling on these new circuits provided by means of the multiplex were as good as the ordinary telephone circuit provided in the ordinary way.

It is difficult to explain in non-technical language how it is possible to carry on five telephone conversations simultaneously over a single pair of wires. It is necessary to send over this pair of wires five different electric currents at the same time and to provide means so that at the ends of the pair of wires these currents may be completely separated from each other, so that each current coming from one particular telephone at one end may go to a particular telephone at the other end, although on the toll line the five currents have all been mixed together. The problem is to so modify each current before it goes on to the multiplexed part of the circuit that each current, while preserving its ordinary characteristics, has imposed upon it a new characteristic which will enable the apparatus at the receiving end of the circuit to distinguish the currents from each other. This is done by combining each ordinary

telephone current with a carrier current of definite higher frequency. The frequency or the wave length of each of the carrier currents is different from that of the other carrier currents used on the same pair of wires and is adjusted to the separating devices at the distant end of the line.

The underlying principle may be illustrated by considering a composite photograph of five individuals. Given such a composite photograph of the ordinary kind, it would obviously be impossible to derive from it the picture of each of the five individuals going to make it up. If, however, the composite photograph had been made up in five different colors, say, one red, one blue, one green, one yellow, and one violet, it would then be possible, by looking at the picture through colored glasses, to see any one picture separate from the others. If red glasses were used, the picture printed in red only would be seen; if blue glasses, the picture in blue, etc., although when looking at it in the ordinary way all of the pictures would be seen together and only the combination would appear. As the tint of each picture serves as a means of differentiating it from the others, so the frequency of the carrier currents serves to differentiate each of the conversations in the new telephone multiplex.



Some of the men who have been closely connected with the development of the multiplex telephone. From left to right (standing)—H. J. Vennes, Western Electric Co.; E. O. Scriven, Western Electric Co.; Lloyd Espenschied, A. T. & T. Co.; H. A. Affel, A. T. & T. Co.; H. F. Korthauer, Western Electric Co.; J. R. Carson, A. T. & T. Co.; R. A. Heising, Western Electric Co.; John Davidson, Jr., A. T. & T. Co. (Seated)—H. D. Arnold, Western Electric Co.; O. B. Blackwell, A. T. & T. Co.; E. H. Colpitts, Western Electric Co.; B. W. Kendall, Western Electric Co.; H. S. Osborne, A. T. & T. Co.

Naturally, to accomplish these results considerable amounts of apparatus are required at the terminals of the multiplex lines, and there are also required changes and rearrangements in the wires themselves. It is for this reason that the system, while physically applicable to wires, either long or short, is economically limited in its usefulness to long wires. On subscribers' lines or on short local or suburban trunks, its cost and the complications would not be justified.

SAVING THE WASTE IN THE CHIMNEY---IV

BY ROBERT SIBLEY AND CHAS. H. DELANY

(The loss of draft in boilers, flues and turns is a matter of prime importance in any study of increasing chimney and boiler room economy. Herein is treated by the authors of the recent book on "Elements of Fuel Oil and Steam Engineering" a discussion of several important points connected with chimney draft in the modern steam power plant.—The Editor.)

DRAFT LOSSES IN STEAM POWER GENERATION

The loss of draft is greatest in boilers having the largest path of gases, the greatest velocity, and the greatest number of changes in direction of flow of gases. A boiler having a single pass with the hot gases entering at the bottom and leaving at the top has a minimum draft loss. In most designs of boilers, however, this arrangement cannot be adopted as the area of gas passage would be too large. This would result in the gases short circuiting, that is passing in a narrow stream from one corner to the other without coming in contact with all of the heating surface. To make the heating surface effective in absorbing heat from the gases it is therefore necessary to provide baffles in the boiler, which deflect the gases and cause them to travel back and forth until their temperature has been reduced as much as possible.

The arrangement of baffles is a feature of boiler design and need not be entered into here. It is well, however, to refer briefly to the general principle involved, namely, that the higher the velocity of gases traveling over the heating surface the greater will be the coefficient of heat transfer. Consequently it would seem that in order to insure maximum efficiency of the boiler there should be a large number of passages of small area, so as to insure high velocity to the gases. This is true up to certain limits, but unfortunately it is soon found that the additional loss of draft caused by increased friction and extra changes in direction of the gases makes the production of the required draft both difficult and expensive.

Saving the Waste in the Chimney is accomplished not by the chimney itself but by the boiler, for it is the boiler that cools down the gases before they enter the chimney. Consequently the design of the baffles of the boiler is very closely related to the subject in hand. In the majority of water tube boilers the baffles are arranged for three passes, that is the gases are forced to travel the length or height of the boiler setting three times before reaching the stack. With this arrangement the areas of passes are such as to give the gases a velocity of 10 or 15 ft. per second when the boiler is operating at its rated capacity. By increasing the number of passes to four or five the velocity may be increased to 20 or 30 ft. per second. This results in a higher rate of heat transmission so that more heat is absorbed from the gases, reducing their temperature and resulting in less waste to the chimney.

To enable the number of passes in a boiler to be increased the chimney must be designed to suit the increased loss of draft that will occur. Thus in every case the actual draft loss should be deter-

mined as closely as possible, and the actual figures for the particular case in hand used in designing the chimney. It is desirable in all cases to design the stack for a greater draft than is expected, for it is a simple matter to reduce the draft by closing in on the damper, whereas if the draft is insufficient nothing can be done to increase it. Again, it may be desired at some future time to increase the number of passes in the boiler, or otherwise modify the baffles in such a way as to require more draft. This would be impracticable unless the stack is large enough to produce a surplus of draft.

In order to give the reader some general ideas of computations involved in ascertaining draft losses assumed in design we shall now pass to a brief consideration of this problem.

Loss of Draft in Boilers. The loss of draft through a boiler proper will depend upon its type and baffling, and will increase with the per cent of rating at which it is run. For design purposes, it may be assumed that the loss through a boiler will be 0.25 in. when it is run at its rating, .40 in. at 150% of its rating and .70 in. at 200% of its rating.

Loss in Flues and Turns. With circular steel flues of approximately the same size as the stock or when reduced proportionally to the volume of gases they are to handle, a convenient rule is to allow 0.1 in. draft loss per 100 ft. of flue length and 0.05 in. for each right angle turn. These figures are also good for square or rectangular steel flues with areas sufficiently large to provide against excessive frictional loss. For losses in brick or concrete flues these figures should be doubled.

Thus the loss in draft flues and turns for an installation having a flue 100 ft. long and containing two right angle turns is

Loss for flues, per 100 ft.	0.1 in.
Turns—2 x .05	0.1 in.
	0.2 in. loss.

Total Available Draft Required. We are now enabled to compute the total available draft required for a boiler installation by summing up the separate components required for the furnace, for the boiler, for the flues and for the turns.

Thus in the illustration carried through from the previous discussion we find that the total available draft is

$$0.6 + 0.4 + 0.1 = 1.2 \text{ in.}$$

The simple rules brought out in this discussion should, when thoughtfully applied, aid the engineer in checking over the economy of his installation and in case of a new design they should serve as axioms for efficient practice in saving the waste in the chimney.

SPARKS—Current Facts, Figures and Fancy

(The United States now supplies nearly one-half of all the manufactures imported or exported in the world, the largest radio station is at present located in America, we seem to be free from tigers and elephants—but some of the other countries are enterprising as well, as indicated by the following brief items of interest from all over the world.—The Editor.)

Two hundred thousand pounds of lemon drops were being used every month by our soldiers while the war was on. So great was the demand that special precautions were taken to secure pure materials and government orders to this amount were distributed through the country to be made by a specified government receipt.

* * *

Are we overlooking ability for higher positions among the office girls? That clerks in the government employ advance more rapidly than stenographers is the complaint of a young woman now in the employ of the Emergency Fleet Corporation who suggests that a little training along other lines offered to these workers will produce material especially available for higher lines of work.

* * *

Telephone wire is the sine qua non of the trenches. It is used to hang pictures on the walls of the dugouts, to mend cots and to make them. Men who have been "over there" have said that frequently soldiers have stopped in their pursuit of the Hun to gather bits of telephone wire lying along the blood-soaked fields of No Man's Land.

* * *

The toll of the influenza has been appalling, but at least it is a temporary affair. What if this country were infested with snakes like India, where snake bite causes some 24,000 deaths yearly. Two thousand one hundred and seventy-six persons were killed by wild beasts in 1917, which was a marked reduction over the year before. Among those responsible were tigers, wolves, elephants, hyenas, pigs and crocodiles.

* * *

Holding church services by telephone was one result of the influenza epidemic. This was done by one church in Muncie, Ind., which arranged that at 10:30 o'clock, through the cooperation of the local telephone company management, the telephones of all subscribers who wished should be connected with the telephone in the church, to which a special sounder was attached. The church organist also played a few numbers.

* * *

The Osaka Electric Railway Company, an inter-urban railway running between Osaka and Nara through the great tunnel of Ikoma, has made quite an innovation in utilizing its tunnel as a summer feature for pleasure passengers. The temperature in the tunnel is so low that quite a cooling effect is obtained in riding through it, the company offering a special discount for tunnel riders during the summer.

A recent fair held in Sweden brings out the shortage of oil and the many substitutes and methods of economy displayed. The efforts of the lighting industry to find a substitute for the kerosene lamp are shown at the fair in the form of carbide lamps for use in places where there is no electric current—a battery lamp called the "Mercal," and also the Jungner primary elements intended for the electric lighting of entire buildings.

* * *

The United States is now supplying nearly one-half of all the manufactures that enter the national commerce of the world, according to an English journal. Five years ago she stood third on the list of exporting countries. Today she is so far ahead—the value of her exports being practically double that of England—as to be in a class by herself. This, of course, is purely a war condition and its maintenance in any degree is dependent on the enterprise of American business in the next few years.

* * *

The displacement of riveting by electric welding in ship construction is being considered in English insurance circles, with regard to possible reduction in rates. It is claimed that welded plates stand the impact test as well as riveted plates, but underwriters require further information on the question of the results of stranding and collision. The cost of electric welding is stated to be much below that of riveting, and if similar insurance rates may be secured will undoubtedly supplant riveting to a great extent.

* * *

The radio station at Annapolis is still the largest and most powerful in the world. It has sent messages to Panama and Honolulu in the west and to Rome in the east. There is reason to believe that the station now being completed by this government in Bordeaux will be powerful enough to communicate directly with the Philippines, thus completing the circle around the world. It is regarded only as a matter of time until this result is possible.

* * *

Deep diving a hundred or more miles inland is one of the items of expense on the account of the Pacific Gas and Electric Company. The intake to the water supply above the hydro-electric plant operated by the company in Croada Pass had become clogged with logs and debris 100 feet below the surface of the lake, and until the passage was cleared it was impossible to run the plant to capacity. It was therefore necessary to use a diver who had to operate from lines suspended from cliffs nearly 100 feet in height.

PERSONALS



A. W. Childs, superintendent of sales for the Southern California Edison Company, has been appointed chairman of the commercial committee of the Pacific Coast Section, N. E. L. A., to succeed E. B. Walthal, who has resigned on account of ill health resulting from a severe attack of influenza. Mr. Childs has been in the service of his company for 17 years, having served as district agent at Pasadena, Long Beach and Redlands, and for the past five years as assistant general agent, during which period he has had under his

especial attention all sales of power, light, apparatus and appliances for his company, which totals a volume in annual returns equaled by few other similar companies in the world. The commercial problems of readjustment that confront the industry at this period are unusually interesting and of great importance to the West. It is confidently believed that the commercial reports at the great Coronado convention, the latter part of April, will be brimful of helpfulness, due to the strong composition of this committee under the able leadership of Mr. Childs. The other members of the committee are: W. S. Berry, J. B. Black, C. M. Brewer, C. O. Case, S. W. Coleman, H. H. Courtwright, C. M. Einhart, W. L. Frost, H. J. Kister, F. A. Leach, L. H. Newbert, C. S. Northcutt, C. Remschel, T. W. Simpson, E. B. Walthal, P. M. Wentworth.

Frank Karr, president of the Pacific Electric Company, Los Angeles, has been a recent visitor in San Francisco.

A. H. Schmidt, with the Manila Electric Railway and Light Company of Manila, P. I., is a recent San Francisco visitor.

G. F. Wakeman of the Edison Storage Battery Company, with headquarters in San Francisco, is East on a business visit.

L. E. Hinman, formerly city electrician for Medford, Oregon, is now with the engineering force of the Southern Pacific Company at Portland.

J. Lewis Foulk, official of the United States Steel Products Company, arrived in San Francisco from Pittsburg, Pa., recently to confer with local officials of the corporation.

G. E. Arbogast, president of the Southern California Association of Electrical Contractors and Dealers, with headquarters in Los Angeles, is a recent San Francisco visitor.

Lieutenant N. H. Silver has been appointed Northwest representative of the transmission line department of the Pacific States Electric Company, with headquarters in Seattle.

J. C. Manchester of the Economy Fuse & Manufacturing Company, with headquarters in San Francisco, has fully recovered from his recent illness and is again able to attend to business.

Lieutenant A. E. Morphy has received his honorable discharge from the army and has resumed his duties as secretary of the Southern California Edison Company at Los Angeles.

John B. Miller, chairman of the board of the Southern California Edison Company and recently appointed chairman of the Pacific Division of the Red Cross, has recently spent some days in San Francisco in work connected with the Red Cross.

Carl H. Fry has been appointed safety and efficiency engineer for the California Metal Producers' Association with headquarters in San Francisco, to succeed Edwin Higgins, resigned.

Max Loewenthal, Pacific Coast representative of the Panama Lamp Company, is again in his San Francisco office after a profitable business trip to New York City covering several weeks' duration.

Bert Hansen has resigned his connection with H. B. Squires Company, manufacturers' agents of San Francisco, in order to join the sales organization of the Cutler-Hammer Manufacturing Company at Milwaukee, Wis.

W. H. Ellison of the San Diego Consolidated Gas & Electric Company has been elected president of the employees' association of that company. Other officers are: Vice-president, W. A. Lambert, and secretary-treasurer, R. B. Tallman.

W. D'A. Ryan and A. F. Dickerson, illuminating engineering experts for the General Electric Company with headquarters at Schenectady, N. Y., are recent Pacific Coast visitors, stopping off at Los Angeles, San Francisco, Seattle and other business centers.

K. I. Dazey, formerly manager of collections with the Pacific Gas & Electric Company, has taken the position of purchasing agent with the Schaw-Batcher Company, the well-known manufacturers of pipe, who have recently included shipbuilding in their range of industrial activity.

H. Alex Hibbard, general sales agent of the T. & W. Universal Plug Company of Santa Ana, California, is a recent San Francisco visitor. Mr. Hibbard is making a business visit through California and the Northwest and will return to his headquarters at Denver the middle of January.

Meiji Nakoa, chief electrical engineer for the Furukawa Mining Company, Tokio, Japan, has been visiting various points in Canada and the United States investigating electric furnace practice and was recently in Toronto. Mr. Nakoa, who is also a large owner of mining interests in Japan, stated that they pay a half-cent per kw-hr. for hydroelectric power at the mines.

K. E. Van Kuran, Los Angeles manager of the Westinghouse Electric & Manufacturing Company, is a recent visitor to San Francisco, as is also A. E. Wishon, assistant general manager of the San Joaquin Light & Power Corporation, both of whom attended the recent meeting of the Advisory Committee of the California Electrical Cooperative Campaign held in San Francisco.

Percy A. Cupper, recently appointed State Engineer of Oregon to take the place of John H. Lewis, resigned, has



been connected with Oregon engineering matters for some years. He began his work for the State of Oregon in 1905 and except for a few months of private practice, has been employed by the state ever since. He was closely associated with Mr. Lewis in the passage of the Oregon water code and was personally responsible for the working out of the system of surveys and investigations upon which this was based.

His work is seen in the establishment of a system of rural credits and in the present irrigation code and Oregon Irrigation Law, which is, like the water code, serving as a model for similar legislation elsewhere. Mr. Cupper has specialized in law work as well as engineering and his special preparation and experience peculiarly fit him for the position he now occupies, in which he is counted upon to keep Oregon in the foremost rank along engineering lines, which it has hitherto held under the capable leadership of John H. Lewis.

Major John D. Galloway, a consulting engineer of San Francisco, has returned from active service in France where he has had many interesting experiences in the engineering corps of the United States Army. It will be remembered by readers of the Journal of Electricity that Mr. Galloway has been associated in past years with many of the major engineering enterprises of the West, among which may be mentioned the stringing of the long span of wires across Carquinez Straits in California, which until quite recently

was for years the longest span of aerial wire in the world.

F. S. Mills, resident agent for the National X-Ray Reflector Company at San Francisco, has returned from an extended trip through Oregon, Washington and British Columbia. He reports that business conditions are rapidly returning to normal and an optimistic feeling throughout the trade.

E. W. Wagy, petroleum technologist of the U. S. Bureau of Mines, has left San Francisco for an extended trip through Texas, Louisiana and Mid-Continent oil fields for the purpose of making a special study of methods used in those districts in the matter of perforating casing and setting screen pipe. Mr. Wagy is preparing a bulletin covering these subjects which is soon to be published by the Bureau of Mines.

H. Foster Bain, assistant director of the U. S. Bureau of Mines, spent several days during the month of January in San Francisco, visiting the U. S. Bureau of Mines station at Berkeley and the petroleum division at San Francisco. In company with Dr. Duschak, superintendent of the Berkeley station, he left on January 24th en route to Washington, intending to stop on his way to visit the Bureau's station at Tucson, Arizona.

Lieutenant Ralph W. Reynolds, of the 37th Engineers, formerly with the engineering staff of the Pacific Pipe and Tank Company, was one of the first in the occupation of Coblenz and had the pleasure of watching the German army vacate this great center. Readers of the Journal of Electricity will recall that Mr. Reynolds contributed several interesting articles to the columns of the Journal of Electricity on Peruvian engineering life covering features of his work with the Cerro de Pasco Mining Company.

Lieutenant-Colonel A. H. Griswold, plant engineer for the Pacific Telephone & Telegraph Company, who has performed unusually helpful service abroad in establishing telephonic communication among the American Expeditionary Forces in France, has returned to his San Francisco office with the telephone company. Engineers of the West, particularly members of the American Institute of Electrical Engineers, are loud in their admiration and praise for the excellent technical service he rendered the nation in its hour of need.

W. E. Coman, vice-president and general manager of the Northwestern Electric Company of Portland, will be the new vice-president and general manager of the Washington Water Power Company, to succeed Harry L. Bleecker, deceased. Mr. Coman, who is one of the best known light and power men in the Northwest, will assume his duties about March 1. Mr. Coman is well known to the transportation men of the Northwest, having been for years associated with the traffic department of the Great Northern, Spokane, Portland & Seattle, and O.-W. R. & N. roads.

Max Thelen, former chairman of the California Railroad Commission, has been appointed head of the division of public service of the Federal Railroad Administration. He will deal

primarily with the relations between the public, including shippers, and the railroad administration and the Federal controlled railroads. Judge A. C. Prouty, head of the combined divisions, will become director of the division of accounting. This appointment has been made by Director-General Hines in view of the separation of the former division of public service and accounting which became effective February 1st.

John Clausen, vice-president of the Crocker National Bank of San Francisco, has just been made a vice-president of the Chemical National Bank of New York City. Mr. Clausen's appointment is of unusual interest to readers of the Journal of Electricity in that he has contributed many helpful articles to its columns on increasing international friendly banking relations with the Orient. Electrical engineering and electrical products are becoming of increasing importance in the upbuilding of our Pacific Coast relations with countries bordering the Pacific and Mr. Clausen, through the Journal of Electricity, has wonderfully assisted in this great work.

K. Uchida, former vice minister of communication of Japan, was a recent visitor in San Francisco where he announced that communication between San Francisco and Japan will be improved within the next two years by the laying of two new cables between that city and two cities of the Mikado's country. The initial agreement, according to Uchida, provides that the cables are to be built, operated and controlled jointly by this country and Japan. It is known that San Francisco will be the terminus for both cables, and that one will terminate at Yokohama, but it has not been decided at which city in Japan the other will end or whether the lines will touch at Honolulu.

OBITUARY

W. J. Hammond, assistant engineer in the gas and electric department of the California Railroad Commission, died of influenza Sunday, February 2, 1919.

E. H. Jacobs, superintendent of the Western States Gas & Electric Company at Stockton, California, died of influenza during the last week in January.

B. J. Simpson, agent of the San Luis Obispo and Paso Robles district of the San Joaquin Light & Power Corporation, passed away February 4, 1919, after ten days illness from influenza. His loss is keenly felt in the great district he so efficiently served. He was formerly with the Southern Sierras Power Company and proved an able man in handling affairs of his company having to do with the public.

Clarence Netzen, chemical engineer, of the U. S. Bureau of Mines, with headquarters at the Bartlesville Station of the Bureau, died suddenly of pneumonia following an attack of influenza at Bartlesville, December 11, 1918. Mr. Netzen had just returned from a trip to San Francisco and Los Angeles, where he had been engaged in Bureau work in connection with the Ordnance Department Toluol Plant at Vernon, California. Presumably he contracted the disease en route between San Francisco and Oklahoma, as he was in perfect health on leaving San Francisco six days previous to his death.

Errata Notes: In the excellent article on "Electric Generation by Diesel Engine" under the authorship of E. J. Richards, appearing on page 167 of this issue, should read as follows: Eighth line, second column, 425000 pounds instead of 42,500 pounds; on page 168, 2nd line, first column, 2300/4400 volts should read 2300/44000 volts.

The Reconstruction Issue of the Journal of Electricity, Jan 1, 1919, has been completely exhausted and many unfilled orders are on file. Twenty-five cents will be paid for each copy that is returned in good condition to the office of the Journal of Electricity.

MEETING NOTICES FOR ELECTRICAL MEN

(Considerable activity marks western societies during the last two weeks. Interesting programs have been presented at local meetings—and comprehensive plans made for conventions and meetings to come. The Jovian Order plans its reconstruction along other lines—and the A. S. M. E. announces the taking over of the Engineering Index.—The Editor.)

San Francisco Electrical Development League

The meeting of the San Francisco Electrical Development League for Monday, Jan. 27, 1919, proved of unusual importance to the industry. Arthur Kempston, head of the department of electricity for the city of San Francisco, as chairman of the day, introduced a discussion of the situation of the base board receptacle in the use of electrical appliances. E. N. Brown, chief engineer of the Majestic Electric Development Company, showed how the manufacturer can cooperate by putting out good quality. W. D. Kohlwey, a prominent contractor-dealer, pointed out the difficulties under which the dealer labors in selling appliances that he knows should not be connected up to fixtures but by means of the base board receptacle. Clyde Chamblin, president of the San Francisco division of the California Association of Electrical Contractors and Dealers, showed why the base board receptacle is a growing necessity. L. H. Newbert, chairman of the Advisory Committee of the California Electrical Cooperative Campaign, pointed out how the central stations are perplexed with the problem and how only by tact, patience and education can relief be expected.

The following committee was appointed to investigate the problem and report recommendations at some future meeting: Arthur Kempston, chairman, E. N. Brown, W. D. Kohlwey, Clyde Chamblin, L. H. Newbert and A. H. Halloran. During the first two weeks of February meetings were held covering the problems of reconstruction and on the consular service. At the meeting of February 3rd, Ralph T. Fisher, district vocational officer of the Federal Board of Vocation and education, spoke on "Reclaiming Disabled Soldiers." Dr. Linn T. White, recently returned from the war zone, told of his experiences on the Western Front at the meeting of February 10th. George W. Fishbeck of the U. S. Consular service spoke on "Consular and Diplomatic Practice." Officers were elected as follows:

President, Henry Bostwick, S. F. District Mgr. P. G. & E. Co.; vice-president, E. O. Shreve, S. F. Mgr. G. E. Co.; 2nd vice-president, J. F. Pollard, Commercial Dept., Sierra & S. F. Power Co.; secretary, J. W. Redpath, secretary California Ass'n Electrical Contractors and Dealers.

The February 24th meeting is planned as a joint luncheon with the Business and Professional Women's Club of San Francisco with an especially interesting program.

San Francisco A. S. M. E.

"Electric Arc Welding" was the subject of a most interesting discussion at the February 13th meeting of the San Francisco A. S. M. E., held at the Engineers' Club on that evening. The speaker was F. A. Anderson, electrical inspec-

tor U. S. Shipping Board, and formerly in charge of arc welding work at the Hog Island yard, who spoke with authority from the electrical standpoint. A general discussion of the relative merits and different uses of electric arc and oxy-acetylene welding followed. The lecture was well illustrated with lantern slides.

Robert Sibley, editor of the Journal of Electricity, has been chosen by the San Francisco and Los Angeles sections, A. S. M. E., to act on a national committee of five to nominate national officers of the society.

Pacific Service Employees' Association

The first meeting in 1919 of the Pacific Service Employees Association was held at the Elks Club, San Francisco, at 8:15 o'clock Tuesday evening, February 11th. The entertainment committee had provided a one-act playlet called "The Ninety Thousand Girl" which proved most entertaining. The cast was selected entirely from the association membership and the playlet produced under the personal direction of Frank Mathieu, for ten years director of the Bohemian Club "grove plays." The Bohemian "Jazz" Quartet provided incidental music and dancing was enjoyed later.

Joint Meeting at Portland

A joint meeting of the N. E. L. A. and A. I. E. E. of Portland, Ore., was held at Library Hall, Multnomah County Library, at 8:00 p.m. Feb. 4, 1919. A paper illustrated by moving pictures and lantern slides, "Deep Water Submarine Telephone Cable," was presented by Mr. H. J. Sheppard of Seattle, Wash., who described the

laying of one of the longest submarine cables on the Pacific Coast across Puget Sound.

Meeting of Advisory Committee, California Electrical Cooperative Campaign

The advisory committee of the California Electrical Cooperative Campaign held a most important meeting on Friday, February 7, 1919, at which plans for the coming year were discussed in full detail. Announcement of these plans is given in full elsewhere in this issue.

Attention was called to a very effective course in electrical contracting, wiring, motor installation and study of the elementary laws of electricity that is being planned by the Extension Division of the University of California, in which the Journal of Electricity has offered its columns for furthering of this important educational work. By unanimous vote the committee decided to cooperate in every manner possible in this effort of the University Extension division to be of ever increasing value to the State.

BUILDERS OF THE WEST—XLVII



THOMAS A. EDISON

Seventy-two years ago this month there was born an inventor, the products of whose genius will live as long as human intelligence is able to combine material elements for lifting the burdens of the human race. From the harnessed waterfall in the mountain fastnesses of the West to the triumph in electrical illumination at the wonderful Panama-Pacific Exposition we witness the fruits of his labor. To Thomas A. Edison, marvelous inventor and withal a modest and exemplary citizen, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his enduring work for the West.

An informal luncheon was held at the noon hour, the following guests being present: Harry Bostwick, manager San Francisco District, Pacific Gas & Electric Company; Waldo Coleman, general manager Coast Counties Gas & Electric Company; J. B. Black, salesmanager Great Western Power Company; M. A. De Lew, president California Association of Electrical Contractors and Dealers; J. F. Pollard and Wm. McKinley, Sierra and San Francisco Power Company; and W. M. Deming and Robert Sibley of the Journal of Electricity.

Quarterly Meeting of the California Association of Electrical Contractors and Dealers

The quarterly meeting of the California Association of Electrical Contractors and Dealers was held in San Francisco on Thursday, Feb. 8, 1919. The meeting proved unusually helpful in clarifying several problems that had arisen in the jobbing and dealer fields of activity. The plans for the year in the Cooperative Campaign were outlined and unusual interest was manifested.

Seattle Section, A. I. E. E.

The meeting of the Seattle Section, A. I. E. E., on Jan. 21st, was a very interesting and profitable one for those attending. The business of the evening included a discussion of the benefits and plans of the Associated Engineering Societies of Seattle. This matter will be taken up in detail at the next meeting.

Capt. Norwood W. Brockett, a Captain of Artillery, recently returned from France, gave an instructive talk on some of the experiences he had gone through and some of the difficulties to be overcome in connection with his work. From a small harbor at Brest, with facilities for landing only one vessel at a time, a wonderful system of docks and railroad yards comprising miles of sidings, has been built up in marvelously short time. Just as the American soldier made a fighter to be feared, and learned the game in a comparatively short period because of his versatility, so the engineer that transported the soldier and his supplies to the front line trenches has made good and proved America's worth.

A great deal of work has been done in organizing the Associated Engineering Societies, but due to war conditions, the plans for the benefit of the member associations have been delayed. A renewed interest is now apparent, and a large attendance at the next regular meeting is absolutely necessary in order that a thorough familiarity with the subject be gained from the discussion. The following committees were appointed:

Executive—John Harisberger, chairman, T. C. Smith, secretary, A. A. Miller, J. D. Ross, C. E. Magnusson.

Papers and Meetings—G. E. Quinan, chairman, C. A. Whipple, O. L. Coward, L. F. Curtis.

Membership—J. Hellenenthal, chairman, R. L. Rockwell, G. H. Moore, Lewellyn Evans, W. T. Batchelder.

Councillors on Joint Council of Associate Engineers' Society of Seattle (Room 320, Boston Block)—A. A. Miller, term expires Dec. 31, 1920; W. R. Hendry, term expires Dec. 31, 1919.

Oregon Society of Engineers

The annual meeting of the Oregon Society of Engineers was held at the University Club, Monday, Feb. 3. Fred Lockley told the members interestingly about his experience and observation in the camps and on the firing line in France. Measures before the Legislature in which engineers are interested were discussed.

Joint Engineering Societies of Seattle

At the meeting of the Joint Engineering Societies of Seattle on Jan. 22, held under the auspices of the local branches of the American Chemical Society and the American Society of Civil Engineers, Dr. R. S. G. Byers, recently a Captain in the Chemical Warfare Service at American University, recounted some of the tasks assigned to them and the dangers attendant thereon. The relating of actual occurrences connected with explosions of varying magnitude in the progress of the tests was sufficient to convince the audience that real work was being done. Incendiary and gas shells

were made up and tried out by firing from cannon and watching the results under field conditions.

Mr. John L. Hall, one of Seattle's prominent civil engineers, read a paper on "Engineering Education," in which he urged a closer relationship between the engineering profession and the student in the engineering college. Discussion of the paper followed, in which Prof. Magnusson of the University of Washington presented the plan of alternating the student between class work and practical work in the shop, according to the Cincinnati plan, but at longer intervals. These intervals might be chosen at will, even as long as three months practical work intervening between class room instruction periods. That this would require a large labor turnover for the shops was the chief objection voiced in the discussion.

Plans for Reconstruction of Jovian Order

An unofficial committee composed of members of the St. Louis Jovian League proposed to Jupiter's Cabinet on Jan. 17 that the Jovian Order be expanded into the National Electrical Board of Trade. It is also proposed to have the activities of the organization primarily business instead of pleasure.

A membership of at least 100,000 is expected, and no change has been suggested in the present optional dues of \$2, \$5, \$10 or \$20 per year. The important electrical interests would be asked to guarantee sufficient individual memberships to finance the board during the period in which the plans are being put into effect. When the project gets to be self-supporting all such underwriting payments would be refunded.

The Engineering Index

The Engineering Index, published for 25 years in The Engineering Magazine and its successor, Industrial Management, and universally regarded as the standard index to engineering periodical literature, has been acquired by The American Society of Mechanical Engineers, and hereafter will be compiled and published by that society. As heretofore, The Engineering Index will be regularly issued in three different forms:

1. As a part of The Journal of the Society.
2. As a separate monthly publication for libraries or individuals desiring to clip the items for indexing purposes.
3. As an annual volume in which all the items for the year are collected.

The Engineering Index originated with Prof. J. B. Johnson of Washington University, St. Louis, Mo., in 1883, and for 12 years was prepared under his direction and published by the Association of Engineering Societies. It was then taken over by The Engineering Magazine Company of New York and has since had the personal attention of Mr. John R. Dunlap, the president of that company, who has found it to be a widely appreciated undertaking by engineers throughout the world. The development of his magazine in the specialized field of industrial management, however, made it seem desirable to place The Index in the hands of an engineering organization covering a broader field and serving engineers engaged in more varied activities.

Through the facilities afforded by the magnificent library of the Engineering Societies, which regularly receives 1,100 periodicals from all parts of the world, the Society has unlimited possibilities in publishing The Index. These periodicals comprise one of the most complete collections of current engineering literature in the world—in not less than ten languages and received from thirty-seven countries. The indexing of engineering articles can be best accomplished by a professional organization and the Society will consider it one of its greatest services to place at the disposal of engineers, through the Engineering Index in The Journal, the means for using the wealth of data and general information published from month to month in the world's technical press.

San Francisco Section. A. I. E. E.

The last meeting of the San Francisco Section, A. I. E. E., was held at 7 o'clock, Friday evening, February 7, in the rooms of the Engineers' Club, Mechanics Institute Building, 57 Post street. The subject of the "Unification of Manual and Automatic Telephone Systems at Los Angeles" was taken up by D. E. Wiseman, equipment engineer of the Pacific Telephone & Telegraph Company. Mr. Wiseman's paper dealt with a subject considered by telephone men to be one of the milestones in the history of telephone engineer-

ing. The speaker outlined what had been accomplished and how it was done. The paper was well illustrated with a number of diagrams of particular interest.

The meeting held on January 24, 1919, in which the subject of the University and its curricula for engineers was under discussion, proved unusually helpful. As the meeting was a joint affair composed of the five national engineering societies, discussion was entered into from many interesting angles. The following delivered papers as leading features in the symposium: John A. Britton, Professor C. L. Cory, Professor C. D. Marx, J. W. Beckman and T. A. Rickard.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—J. H. Cunningham, General Electric Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittcock Block, Portland, Ore.
Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 5:15 p.m., followed by regular meeting.

San Francisco Section

Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—T. C. Smith, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch

Chairman—Albert S. Anderson, Boulder.
Secretary—Terrill C. Smith, University of Colorado, Boulder.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Hapbold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Chairman—C. H. Suydam, Stanford University.
Secretary—Frank Miller, Stanford University.

Montana State College Branch

Chairman—Roy C. Hagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College

Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch

Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.
Secretary—W. H. Morton, 110 West 40th St., New York.
Executive Committeemen-at-Large—W. D. Kohlwey, California; Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland, J. F. NePage, Seattle, Wash.

British Columbia Ass'n Electrical Contractors and Dealers

President—E. Brettell, Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—M. A. DeLew, 180 Jessie St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—C. L. Chamblin, 641 Mission St., San Francisco.
Secretary—J. Stewart, San Francisco.
Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and Dealers

President—G. E. Arhagast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 5:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers

President—R. C. Kenney, Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers

President—J. H. Sroufe, Jaggard-Sroufe Co., Portland.

Sacramento Section, California Electrical Contractors & Dealers' Association

President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overhagh, 411 So. Clinton St., Chicago, Ill.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign

Chairman Advisory Committee—L. H. Newhert, 445 Sutter St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

National Electric Light Association

President—W. F. Wells, Edison Elec. Illuminating Co., Brooklyn.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.

Nevada Section, N. E. L. A.

Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.

President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Crossley Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.
 Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.
 Secretary—F. H. Murphy, Portland Railway, Light & Power Company.

Illuminating Engineering Society
 President—George A. Hoadley.
 Secretary—Clarence L. Law.
 Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
 Meetings—First Tuesday each month.

New Mexico Electrical Association
 President—James R. Smith, Raton, N. M.
 Secretary—Charles Twogood, Albuquerque, N.M.
 Meetings—Annually, in February.

Southwestern Electric and Gas Association
 President—W. A. Sullivan, Shreveport, La.
 Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
 President—H. J. Gille, Puget Sound Traction Light & Power Co.
 Secretary—W. E. Herring, Puget Sound Traction, Light & Power Co.
 Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
 New officers announced later.

Los Angeles Jovian Electrical League
 President—A. E. Peat, San Joaquin Light & Power Corp.
 Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
 Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
 President—Garnett Young, 612 Howard St., San Francisco.
 Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
 Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
 President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
 Secretary—A. E. Coney, Great Western Power Company, San Francisco.
 Meetings—About every 60 days.

Alameda County Electrical Club
 President—George Drew, Pacific States Electric Company, Oakland, Cal.

Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
 Secretary—H. N. Beecher, City Hall, L. A.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
 President—W. H. Brummage, Pacific Tel. & Tel. Co., San Francisco.
 Secretary—Chas. H. Dodson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
 President—Mortimer E. Cooley, Electrical Engineering Dept., Ann Arbor, Mich.
 Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
 President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
 Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
 Meetings—Quarterly.
 Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
 President—Charles H. McGuire.
 Secretary—T. J. Royer.
 Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
 President—Orrin E. Stanley, Box 973, Portland, Ore.
 Secretary—C. J. Hogue, Box 973, Portland, Ore.
 Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
 President—H. E. Horrocks, Seattle, Wash.
 Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
 Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
 President—A. E. Chandler, New Call Bldg., San Francisco.
 Secretary—J. R. Brownell, 525 Market St., San Francisco.
 Annual Meeting: October.

Idaho Society of Engineers
 President—W. H. Gibson, Mountain Home, Idaho.
 Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
 President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
 President—George S. Nickerson, 914 Forum Bldg., Sacramento.
 Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
 Chairman—C. D. Marx, Stanford University.
 Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
 President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
 Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
 Meetings—Annual.

Portland Section A. S. C. E.
 President—P. H. Dater, Eng. U. S. Forestry Service.
 Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
 Meetings—At call of president.

Spokane Engineering & Technical Ass'n
 President—J. C. Ralston, E.M., E.E.
 Secretary—A. D. Butler, City Engineer, Spokane, Wash.
 Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

Foreign Trade Club
 President—W. H. Hammer, Monadnock Bldg.
 Secretary—Wm. E. Hague, Monadnock Bldg.
 Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
 President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
 Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
 Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

WASHINGTON CAR FARE BILL PASSES SENATE

Carrying an emergency clause, amended Senate bill No. 18, for the relief of street railway companies, has passed the Washington state senate by a vote of 29 to 11. The broad purpose of the bill is to enable the public service commission to set aside the five cent minimum street car fare now provided in the act creating the public service commission and "raise or lower" fares upon a showing by the company, and after public hearing has been held at which all parties in interest are heard. The original senate bill came to the senate with the name of Senator Phipps of Spokane as sponsor. It was drawn by the corporation counsel of Spokane and had the support of the municipal administration of that city, also of Tacoma. Primarily it sought to remove the privately owned street railway companies from the jurisdiction of the public service commission and return the control of such utilities to the city council, empowering the council to increase fares by ordinance. At the public hearing on the bill the representatives of the competing Spokane street car companies opposed the Phipps measure as drawn and offered the amendments that were subsequently written into the amended bill. The act will not affect Seattle if the deal for the purchase by the municipality of the street railway system is consummated, because under the public service commission act, municipally-owned utilities do not come under the supervision of the state commission.

PLANT FOR SEMI-DIESEL ENGINES

The Gulowsen-Grei Engine Company of Christiania, Norway, has just completed a plant at Seattle at a cost of

approximately \$700,000 for the manufacture of semi-Diesel engines on a large scale. The aggregate capacity is 15,000 to 20,000 horsepower per annum. The plant occupies about six acres and is situated on Lake Washington ship canal in the Salmon Bay district. Engines are similar to those made in Norway by this concern, consisting of the surface ignition design, used largely for marine duty, also suitable for operating mills and pumps. At the new plant various sizes will be made ranging from 15 to 360 h.p. Each engine is to be equipped with a small electric generator for charging storage battery to start the engine. The pattern shop, foundry and machine shop and erecting floor, each occupying a separate building, are all equipped with electrically operated machines and tools, requiring about 40 motors and connected load of about 600 h.p. at 440 volts, three-phase. The cost of wiring the buildings for power and lighting was approximately \$25,000. Electric wiring and installation of motors were handled by the Standard Electric Company of Seattle.

EVENING CLASSES IN TECHNICAL SUBJECTS

The Board of Education of San Francisco maintains as a part of its public school system in the technical department of the Humboldt Evening High School at 18th and Dolores streets, free instruction in mechanical, civil, structural, marine, automobile and electrical engineering, naval architecture, architecture and building construction, mechanical drawing, sheet metal pattern drafting, surveying, steel square, strength of materials, estimating quantities and costs, slide rule, and all mathematical subjects. For linemen, cable splicers, inside wiremen, armature winders, telephone main-

tainers, storage battery men, wireless construction men, automobile ignition men, and marine electrical workers, switch-board operators and meter men, special instruction is given in sketching and detailing electrical machinery and apparatus, making diagrams of connection for dynamos, motors, transformers and controlling equipment; making plans for electric light distributing systems and street railway controller systems; laying out motor drives for factories and power houses and making diagrams of telephone and telegraph circuits. With this work special instruction is given in physics and theoretical electricity, including direct and alternating currents and wireless transmission of signals.

Although students may enter this school at any time and do efficient work, it is desirable that they enter as near the beginning of the new term on February 10, 1919, as possible.

NEW IRON WORKS IN CHINA

Announcement is made of the establishment of a new company to be known as the Peiyang Iron Works, organized for the purpose of working the mines in Chihli province. The company is capitalized at \$4,000,000, of which the Chinese government will supply one-fourth, the civil governor of the province one-fourth, and merchants the remainder. The iron works will be established at Hsuanhuahsien.

It is understood also that plans are under way in the province of Anhui for the establishment of an iron foundry, to be called the Hua Chang Iron Foundry, for which a million dollars has already been raised. The office of the company will be at Penpu.

OIL BILL IN CALIFORNIA LEGISLATURE

The following statement is issued by the California State Mining Bureau:

The various industries and the people of California are almost entirely dependent upon petroleum for power and fuel. They must be assured that all possible precautions conducive to a stable and long continued supply are being taken. The question of whether or not their interests in this regard are to be protected is now definitely before the legislature.

A bill introduced by Senator Thompson and Assemblyman Argabrite provides for serving the public interest and that of all the industries dependent upon oil, either through its consumption or production. The bill is based upon the results of the intimate study and investigation made by the State Mining Bureau in the oil fields during the past four years, and combines all the best features developed during the enforcement of the present law. It provides regulations requiring that all oil wells, even those belonging to powerful, but careless, concerns, shall be drilled and maintained in such a manner that the oil deposits will not be ruined merely to obtain quick profits to a short-sighted operator.

The interests of oil operators are safeguarded through sure and speedy action of the superior courts by injunction proceedings against possible error or abuse of power by the state officers. No change in the present general policy of cooperating with and providing for the interests of oil operators is contemplated.

Certain oil producing concerns who have never recognized that the public is vitally interested in the preservation of the oil fields, and have always opposed adequate state supervision, have introduced other bills. Realizing that absolute repeal of a conservation measure would not meet with public approval, their ultimate object is concealed by provisions which would leave merely the skeleton of an impotent law on the statute books. In order to allow no possibility that even a skeleton law might be operative, they further propose to put the enforcement of the law into the hands of a few large oil producers.

BANKING IN THE FAR EAST

Typical of the continual news coming from abroad concerning the ever increasing engineering and commercial relations with the Orient is the recent announcement that the Asia Banking Corporation, a subsidiary of the Guaranty Trust Company of New York City, has opened its Shanghai office and that this corporation expects to branch out at Hankow about the middle of March, and at Tientsin and Peking some time early in May.

U. S. DEPARTMENT OF LABOR ENCOURAGES PUBLIC WORKS

A new division has been created in the Department of Labor for the purpose of interesting the nation in public works and private construction. The division which will carry on this work is now being organized by F. T. Miller, the publisher of construction periodicals. It is called the Division of Public Works and Construction Development, and occupies the building at 16 Jackson Place.

The particular objective of the bureau's research will be to secure data for the use of the construction industry, but the material to be collected will be so varied that the information will be of value to industry generally. The facts made available will be of help to any community or investor in determining whether it is advisable to undertake public or private building at present. When circumstances unfavorable to construction are discovered an attempt may be made to correct them, but there will be no stimulation of economically unsound enterprise.

The inquiry will be under the direction of business men of wide practical experience who are serving without pay. The actual investigation will be conducted by a group of economists and special agents supplied by the Department of Labor and other Government departments or lent by universities. The field will include the cost and supply of building materials, the amount of labor available and its cost, the values of land, prevailing rents, the supply of capital, the amount of construction held up by the war and the demand for building in all parts of the country.

HIGH WATER IN THE NORTHWEST

The following report comes from Chehalis, Wash., dated January 22. The rain was general throughout the Northwest:

Last night and all day the heaviest downpour of rain in the memory of the oldest inhabitants has prevailed in this section. Already the Chehalis and Newaukum valleys are flooded for miles, and by tomorrow record breaking high water is more than likely, even if further slides do not add to the trouble. Today trees carried down the hill north of town by two great landslides buried the street car tracks and carried down the power lines, leaving Chehalis, Centralia and Tenino without light or electric power. Late in the afternoon, however, light service was resumed. In North Chehalis, near the power company barn, a foot of water is pouring over the Pacific highway, coming down Coal creek valley as never before. The general opinion is that the damage done by this flood will be the worst for years.

INVESTIGATION BY JAPANESE GOVERNMENT

The necessity of the accurate measurement and record of the flow water in rivers was keenly felt when the war enhanced the growth of electro-chemical industry in Japan. Prompted by this necessity the Department of Communications has arranged to measure and record all the principal rivers in Japan. The empire island is divided into twenty-two surveying sections and all the rivers promising more than 1000 horsepower are to be recorded. The same measure was taken several years ago with the aim of selecting the rivers for electric light and power industry. Necessary data on the available power for electro-chemical purposes have been lacking which are to be obtained this time. The survey began last July and is now being carried out.

REPORT OF CALIFORNIA RAILROAD COMMISSION

The California Railroad Commission summarizes its year's work in a report recently presented to the governor of the state. "Increases in cost came so rapidly," it declares in defense of its war policy of increasing utility rates, "that it would have been impossible for the Commission to give the necessary prompt relief if attempt had been made to have detailed valuations under normal conditions. The factor of time forbade the remedy which a less comprehensive study would show was needed. The Commission had no hesitancy in allowing such increases as it deemed proper and reasonable. It believes it fully discharged its duty not only to the public, but to the utilities and National Government by allowing increases to enable the utilities to function efficiently and to prevent financial disaster."

The abnormally low rainfall following two unusually dry winters intensified the problems of the utilities, according to the Commission, which continues:

"That the effect of public regulation was of the greatest possible benefit to the utilities themselves during this period (a period that might well be considered the acid test of the efficiency of regulation) is evidenced by the fact that during that period not a public utility in the State of California went into bankruptcy or receivership."

Referring to Federal control of railroads and telegraph and telephone companies, the Commissioners say:

"Contrary to widespread belief, Federal control of interstate railroads has not appreciably diminished the work of the Commission. Unless Federal railroad control continues permanently there will be very little release from related duties. The Director-General of Railroads has asked the Commission repeatedly to perform services and to make recommendations on vital California problems, such as new construction projects in California."

The report then goes on to show what the people of California pay for utility service and gives the following statistics:

In 1917 the water, gas, electric, telephone and telegraph companies and steam and electric railways collected in the form of rates the sum of \$516,663,789.17, as compared with \$451,389,520.15 in 1916. The net operating revenues of the same utilities in 1917 were \$178,071,844.40, as against \$166,102,672.45 in 1916, an increase of \$11,969,171.95. Electric light companies in 1917 reported net operating revenues of \$16,123,663.47, in 1916 \$16,281,693.55.

Despite war conditions, California utilities during the fiscal year ending June 30, 1917, expended in extensions and improvements a sum exceeding one-half the amount expended by the same utilities in the four years 1913 to 1916, inclusive. The electrical companies spent 65 per cent as much in 1917 as they did in the preceding four years. The telephone companies expended about 40 per cent.

TRADE NOTES

Personal Items —

C. E. Ingalls, who has for some months past assumed a joint western managership for the Crocker-Wheeler Company, with headquarters in San Francisco, has with the beginning of the year taken over the entire running of this agency. During the comparatively brief period in which Mr. Ingalls has been identified with the industry in the West he has proved not only an able representative for his firm but he has become actively engaged in practically all the electrical activities in this district, including membership in the



San Francisco Electrical Development League, the San Francisco Engineers' Club, and the Pacific Coast Section, N. E. L. A.

Paul A. Shilton of Los Angeles, manager for R. J. Davis, district sales agent for Century A.C. Motors and Fans, will visit all the cities of Arizona during the month of March. Arthur M. Funke of San Francisco, representing the same company, has been visiting the trade located in the San Joaquin and Sacramento valleys.

Richard Chamberlin, representing the Hurley Machine Company, making his headquarters in Seattle, has just returned from a visit to the factory in Chicago.

Lieutenant C. H. Tallant, formerly advertising manager for Western Engineering and before that in charge of the General Electric Company's publicity at San Francisco, has received his honorable discharge from the army and now is advertising manager for the Pelton Water Wheel Company at San Francisco.

F. W. Milligan, president of the General Porcelain Company of Parkersburg, West Virginia, is visiting the Pacific Coast.

H. E. Sanderson, Pacific Coast manager of the Bryant Electric Company, and Garnett Young, general manager of the Garnett Young Company, have returned to their San Francisco headquarters from a tour of the southern district of California.

S. W. Peterson, of the Stubbs Electric Company of Portland, and C. M. Will of the Fobes Supply Company of Portland, are San Francisco visitors and have been in attendance at the recent Del Monte convention of the Electrical Supply Jobbers' Association.

A. L. McLeod, manager of the Jeffrey-Dewitt Insulator Company of Huntington, West Virginia, has returned east after visiting Pacific Coast points.

F. H. Murray, formerly sales manager of the National Carbon Company in San Francisco, has moved to Los Angeles where he takes the position of district salesmanager of the company's office there. Mr. Murray was originally connected with the Los Angeles branch, to which he now returns.

C. O. Martin has just been discharged from the aviation department of the government service and is representing the Benjamin Electric Manufacturing Company of Chicago, with headquarters at Seattle.

A. Turnbull, previous to the war connected with the heating device department of the General Electric Company, has been released from the aviation department of the service and is now representing the Edison Electric Appliance Company in the Northwest, with headquarters at Portland.

Changes and Beginnings

W. C. Little has opened an electrical supply shop in Porterville, Cal., recently.

It is reported that the electrical supply store of R. E. Fredericks in Sebastopol, Cal., has been sold to J. L. Bone.

The National Electrical Corporation was recently incorporated in San Francisco.

The Calistoga Electric Company of San Francisco has recently applied for dissolution.

C. Shermund has sold his interest in the Acme Electric Company, of San Francisco, to L. A. MacLean.

The Standard Light Control Company of San Francisco has been incorporated for \$250,000, shares \$100 each. The incorporators are: E. J. Henderson, Edw. F. Dowd, R. W. Ebeling, L. E. Voger and L. D. Manning.

Tyrell & Ellison have rented the Fortier building on Walnut street, Red Bluff, Cal., starting as an electrical contractor-dealer establishment.

Pacific Coast Representative —

Baker-Joslyn Company of San Francisco, Los Angeles and Seattle, have been appointed sales representatives of the Jeffery-Dewitt Insulator Company of Huntington, West Virginia, manufacturers of high-grade high-tension insulators. A complete stock of J-D suspension insulators and accessories will be carried at all three warehouses for the convenience of Western users.

Canadian Factory —

Davis Slate & Manufacturing Company of Chicago have just completed arrangements for the equipment of a thoroughly modern slate factory at Toronto, Canada, which will enable them to better serve their constantly increasing number of customers in the Dominion. Mr. A. H. Winter Joyner of 100 Wellington street, Toronto, has been appointed Canadian sales manager, and Mr. William Wright of Toronto as superintendent of production.

A Golf Trophy —

The electrical fraternity in Los Angeles have established the custom of playing golf every Thursday afternoon. The Rome Wire Company of Rome, N. Y., recently presented a beautiful Copper Cup as a trophy to be played for on these occasions.

LATEST IN EVERYTHING ELECTRICAL

(The single geared V-grooved type of elevator has not been used to any extent in this country for high speed passenger service. A description of a recent installation of this type in which a very even rate of acceleration and retardation is secured through the use of a special control is here given, together with brief notes on a new switch especially designed for marine service, a prepayment electric meter and a new device to determine without inconvenience the class of current at a specified outlet, whether a.c. or d.c. and whether the voltage is 110 or 220. —The Editor.)

BRYANT SNAP SWITCH FOR MARINE SERVICE

The snap switch here illustrated is one of the devices of the Bryant complete line for marine purposes. The base is of unbreakable moulded composition with the ratchet plates moulded in. The form of construction eliminates the liability of mechanism becoming loose, which is almost certain to occur in other forms of construction.



While this ratchet plate must necessarily be made of steel, in order to withstand the severe service expected of such a part, it is heavily copper-plated to prevent rusting. The music wire spring which actuates the mechanism is also heavily copper-plated.

This switch is made in both single pole and double pole, and for either type, a $\frac{3}{8}$ in. extension stem for handle is offered for use where water-tight covers are employed. The bases are moulded of such a size as to permit of standard screw spacings for attaching to the box, i. e., $1\frac{1}{8}$ in. on centers. The diameter of the switch base is $1\frac{3}{4}$ in. The height to the top center base proper is $1\frac{1}{8}$ in.

As will be noted from the illustration a groove is provided on the back of the base which is large enough to permit of running a separate circuit through the box.

Two of these switches may be mounted in a standard four-inch box.

PREPAYMENT WATTHOUR METERS

The General Electric Company has developed a prepayment watthour meter called the Type I P-5 for use on a.c. circuits. Electrically, it is the standardized Type I-14 G-E watthour meter. The prepayment device, which is an integral part of the meter, is mechanically operated.

The purpose of this prepayment meter is to make more profitable the accounts of small consumers and of the shifting population of today by lowering the costs for collection and to eliminate the uncollectable accounts from these sources. By also eliminating flat rates to these classes of customers, consumption of electrical energy and consequently of fuel is reduced, and the apparatus investment can be governed by actual requirements of essential operations. In addition, the central station is saved the trouble and expense of cutting service in and out because equipment is undisturbed.

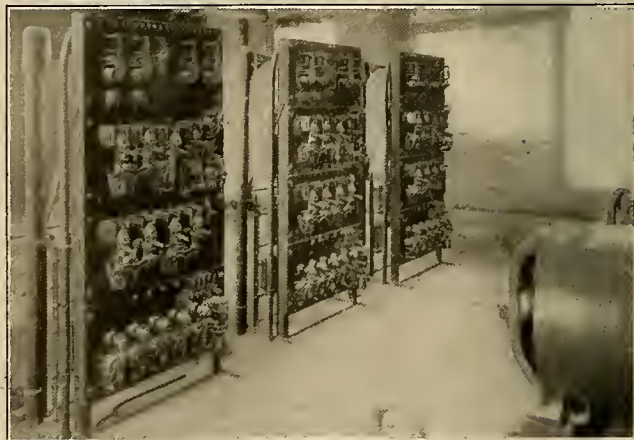
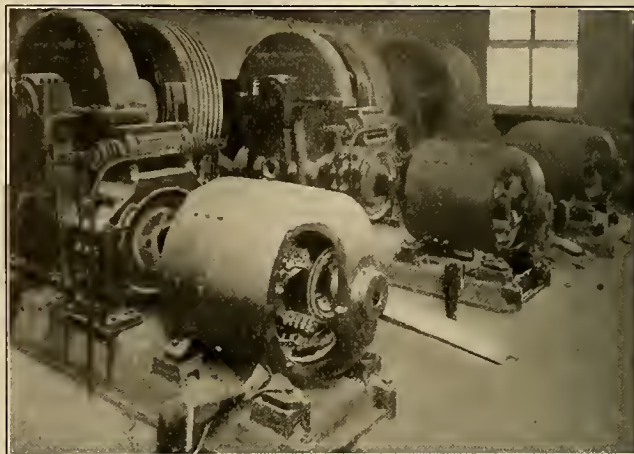
The prepayment mechanism is actuated by a large coiled spring wound when depositing the coin. The only load imposed on the driving element of the meter is that of actuating the tripping device. This requires practically no energy.

The insertion of the first coin and turning of the knob automatically closes the controlling switch. (Twenty coins is the maximum for deposit though the coin box will hold about one hundred.) When energy to the value of the deposit has been recorded the switch is automatically opened until another coin has been deposited. Every precaution has been taken against tampering or beating the meter. Opening it for inspection does not make the cash box accessible except to those having the special key. The rate of charge can be changed by inserting a new set of rate gears.

ELECTRIC ELEVATOR EQUIPMENT

The new Milwaukee Athletic Club Building which was opened to its members during the past summer, is one of the most modern and completely equipped club buildings of its kind. The new clubhouse stands on a plot of ground 120 by 120 feet. It is composed of twelve stories and is 175 ft. in height, being constructed wholly of steel, concrete and cement.

Among the many conveniences installed in the building are three high-speed passenger elevators, and a similar one called a service elevator and one slow-speed freight elevator.



Single gear V-groove traction type elevator machines and motors shown above. Below is shown the automatic controller for each motor.

The type of elevator machine installed is single gear V groove traction, which has not been extensively used in this country until just recently—although a number have been built for export business. The accompanying illustration shows the three elevator machines used for passenger service together with the motors and C-H automatic controllers. The machines were built by the Haughton Elevator Company of Toledo, O. The motors are 35 h.p. 230 volt, 250 to 750 r.p.m. shunt wound, made by Roth Brothers & Company of Chicago, and built in accordance with a combined design of the Roth Brothers Company and the Cutler-Hammer Manufacturing Company, the latter company also furnishing the controllers.

From the specifications of the motor given above, it can be seen that there is a 3 to 1 speed control which is accomplished by shunt field weakening, which gives an economical running condition with each speed except slow-down, and this is used only in making landings. There are three speeds that can be secured from the car switch.

The slow speed (45 to 50 ft. per minute) corresponds to the motor speed with full field and a resistance in series with the armature, and a resistance shunt across the armature. The normal speed (150 ft. per minute) is secured with all of the armature resistance cut out and with the armature shunt open circuited. The high speed (450 ft. per minute) corresponds to the motor speed with field weakening.

A noticeable feature in the operation of the elevator is the uniform rate of the acceleration and retardation, secured through the controllers, which may be briefly described as follows:

Each controller has a single pole magnetic type service switch which remains closed during the hours the elevator is in service. By means of a pilot switch in the car the service switch may be opened when the elevator equipment is to be shut down for any appreciable period, thus disconnecting the motor entirely from the line and eliminating power consumption in the shunt field which occurs as long as the elevator is in service. The two middle panels of each controller carry a double pole magnetic main switch and two double pole reversing switches, also control fuses with metal covers and a try-out switch. By means of the try-out switch the car may be operated from the switchboard without the use of an operator. The lower panel contains the armature accelerating switches which consist of a magnet relay retarded by an air dash-pot and five magnetic accelerating switches. The slow-down is accomplished by means of two switches, one of which is spring closed and which connects a resistance across the motor armature at the same time the armature accelerating resistance is inserted. After this initial dynamic braking has died down, the second switch, which is a magnetic lock-out switch, closes, thus giving another inrush of current and slowing down the car still more. A single pole magnetic switch is also provided to give full field strength to the motor during the dynamic braking period. The field control consists of four single pole spring-closed contactors which open in succession and which insert resistance in the shunt field circuit. A double coil overload relay is also provided on the top panel, which may be reset by moving the car switch to the neutral position.

MAJESTIC DETERMINATOR

Doubt always causes loss. In every case of doubt, there is a loss of time and in most cases of doubt, the loss of time is accompanied by a more or less serious loss of money.

The foregoing applies with more force to electrical work than to any other, as most of the expensive and dangerous burnouts are caused by doubt—doubt as to whether the current is a.c. or d.c.

To end this state of affairs, the Majestic Determinator was called into being. It puts an end to doubt; it instantly determines the class of current at a specified outlet, and at the same time shows whether the voltage is 110 or 220.

When motors, transformers, or any instrument operated by electricity are to be installed, the first thing necessary is to find out what class of current the building is supplied with. Until the Majestic Determinator was invented, there were but two ways to find this out: First, by "feeling the juice," which should never be done as it is always extremely dangerous. Second, by asking the central station, which puts them to considerable trouble and places an unnecessary responsibility upon their shoulders which they are not willing to assume. This method is uncertain, as the central station may be supplying that particular building with both alternating and direct currents.

The Majestic Determinator is an instrument as simple in operation as it is certain. To operate it, all that is necessary is to place the plugs to the wires or terminals, press the button at the bottom of the determinator, and if the current is direct the letters d.c. will instantly appear within one of the circles at the top of the determinator; if the current is alternating, the letters a.c. will appear within the other circle. The brilliancy of the light back of the letters a.c. or d.c. tells whether the voltage is 110 or 220.

The plugs attached to the determinator are knife blade type and are so constructed as to render short circuits or shocks impossible.

With the Majestic Determinator, all open fuses and circuit breaks may be accurately determined. Broken wires or coils, as well as bell and lighting circuits, may be accurately tested with this instrument. It is designed for the use of every wirer, every trouble shooter, every electrical engineer, every superintendent of buildings, or in fact every one having anything to do with electricity.

The Majestic Determinator is 4 inches long, 2 inches high and 1½ inches wide, and weighs 7 ounces.

The Majestic Determinator is being manufactured and marketed by the Majestic Electric Development Company, 656-658 Howard street, San Francisco.

BOOKS AND BULLETINS

Bureau of Standards Pamphlets

The removal of Toluol, benzol and other light oils from gas is considered in Technological Paper No. 117 of the Bureau of Standards, entitled "Toluol Recovery." The authors are R. S. McBride, C. E. Reinecker and W. A. Dunkley, all of the Bureau of Standards.

A new publication covers the subject "Electrolysis and Its Mitigation." We find in this revised edition a rather full discussion of the three-wire method of railway power distribution. The section on pipe drainage has been modified and a paragraph on automatic substations added.

A New Book on Municipal Ownership

One of the most interesting volumes on the subject of municipal ownership which has so far appeared is that entitled "The Results of Municipal Electric Lighting in Massachusetts," written by Professor Edmond Earle Lincoln of Harvard University. This work won the \$1,000 cash prize for the year ended June 1, 1917, offered by Messrs. Hart, Schaffner & Marx for studies of economic and commercial subjects. It appears that Professor Lincoln selected the state of Massachusetts for a thoroughgoing study of public ownership compared with private ownership and operation. In this state he found a considerable number of municipal plants which have been operated for a long time. Massachusetts also is the state which was the pioneer in the regulation of public utilities by a state commission, and in which the largest amount of data has been recorded over the longest period. In the first chapter of the volume the author reviews practically all of the important literature on public ownership which has appeared in the United States, finding that very little of a really thorough and conclusive nature has been developed. No one who reads the book can fail to be impressed with the honesty of Professor Lincoln's investigation and his impartial attitude. His general statements are backed up by a great mass of carefully presented statistics and his conclusions are given in the final chapter. These conclusions are generally in favor of the private ownership and operation of electric lighting plants under adequate public regulation, when progressively conducted. He says:

"Business now carried to a reasonable degree of perfection by the public powers will, if retained in public hands, be in danger of rapid

stagnation. Whatever the sequel may be, this modest study, as well as most careful and unbiased investigations, points to the conclusion that as a rule only the simplest and the 'well-seasoned' enterprises are at all suitable for public operation; and even these are in grave danger of becoming less efficient than they would be in private hands. Though political expediency or social necessity may sometimes momentarily outweigh all economic considerations, it still seems inherent in the nature of things that private industry must continue to show the way."

Fixture Bulletin

A general bulletin covering wall and desk fixtures suitable for the display of advertising copy, map and tack systems, pictures, plans, posters, hardware and small supplies and the like has been issued by the Universal Fixture Company of New York.

Miniature Eye Comfort

A neat little miniature reproduction of their folder magazine "Eye Comfort" has been issued by the National X-ray Reflector Company to suggest to its readers the advantages to be obtained from the larger book.

Mining Bulletins

The Bureau of Mines, Department of the Interior, has just issued the first of a series of bulletins containing the mining statutes of different states under the title of Bulletin 161, "California Mining Statutes Annotated," by J. W. Thompson. The purpose of this bulletin and others of like nature which are to follow is to point out the laws and regulations best adapted to increase safety and efficiency in the mineral industry of the United States and to aid legislative bodies in framing uniform mining laws. The State of California, by reason of its historic interest in mining and by reason of its great extent of mineral land and its vast mineral deposits, has been selected for the first bulletin of the state series.

Illuminating Engineering

National X-Ray Reflector Company has just published a new book on illuminating engineering entitled "Lighting from Concealed Sources." This is a 250 page volume, 8 x 10 in., containing 500 illustrations to amplify the facts stated in the text. It has a stiff buckram binding so as to preserve it for permanent use. Copies will be sent to interested engineers and architects upon application to F. S. Mills, resident engineer, 742 Market street, San Francisco. Another text on Office Lighting is a recent addition to the valuable series of lighting books distributed by the company.

Historical Review of Steam Turbine Progress

The Westinghouse Electric and Manufacturing Company has just issued their Circular 1591, subtitled "An Historical Review of Steam Progress." This publication was written by Francis Hodgkinson and is a reprint of an article which appeared serially and is now gathered together in one publication with the intention of becoming a handbook on steam turbine progress. The early history of steam turbine engineering is gone into and the earlier machines installed in America are illustrated. From 1899 until 1917, each year's development is properly recorded as it occurred and the improvements noted. The booklet is profusely illustrated with views of all the different types of impulse and reaction turbines and the construction of blading, valve chamber, governor, throttle valve, coupling and oil cooler are shown in detail. This publication should be a valuable addition to designing and consulting engineers and is being used extensively in the government training classes for junior engineers on steam engineering work.

Uruguayan Construction

The American International Corporation has issued a bulletin describing the work on water works and sewerage systems in Uruguay and other construction in which the organization is interested. The booklet is attractively illustrated and gives a comprehensive idea of the nature of these enterprises and the conditions under which they are carried out.

Hydro-Electric Power Commission of Ontario

Two most valuable reports are available from the Hydroelectric Power Commission of Ontario, as the result of experiments and investigations made during the last year. A report on "The Rate of Coal Consumption in Various Electric Generating Stations and Industrial Establishments in Canada and the United States" gives comparative figures for various types of central stations, together with useful charts and much supplementary data of interest. The report on "The Heating of Houses—Electricity and Coal Compared" is designed to discourage the view commonly held by the public, that electricity is a possible source of heat for general use. As is there pointed out, the cost of electric heating at prevailing rates would be some four times that of coal, there is no summer demand sufficient to utilize the current which would be released during that season, and the six million h.p. which represents the estimated total possible development of Ontario water power is not sufficient to supply the existing homes of Ontario for heating alone, exclusive of other requirements.

Western Electric Year Book

The Western Electric Company have issued their year book for 1919, listing manufactures and material carried, together with brief descriptions and price lists. The book is 1120 pages long, is profusely illustrated and is bound in neat gray board covers.

Electricity and Magnetism for Engineers

Part I, Electric and Magnetic Circuits

by Harold Pender, Ph. D., Professor-in-Charge, Electrical Engineering Department, University of Pennsylvania, Vice-President and Fellow, A. I. E. E.; size 6 x 9 in.; 380 pp.; published by the McGraw-Hill Book Company, Inc., New York, and for sale by the Technical Book Shop, San Francisco. Price \$3.00.

The fundamental laws of electric and magnetic phenomena and their application to some of the concrete problems in the generation, transmission and utilization of electric energy as they are met with by the engineer are taken up in this volume. The book is intended as a text book for engineering students or a review text for those away from daily contact with the subject who may wish to refresh their memories. Particular emphasis is laid upon exact quantitative statements of the laws and principles with a view to the needs of the engineer who is often annoyed by an inability to use the simple formulas as commonly given, owing to the failure in many text books to state their exact limitations. The book is excellent as an advanced text and presupposes a knowledge of mathematics and a general familiarity with engineering subjects. For convenience the work has been divided into two parts, the first dealing with "Electric and Magnetic Circuits" and serving as a preparation for the study of direct current machinery, and the second with "Electrostatics and Alternating Currents." The present volume is part I of the series.

Topographic Stadia Surveying

by C. E. Grunsky, Eng. D. A manual with reduction tables and a new type of reduction diagram. Size 4½ by 7½ in.; 100 pp.; 18 illustrations and a folding plate; pliable binding. Published by D. Van Nostrand Company and for sale at the Technical Book Shop, 171-3 Second St., San Francisco. Price \$2.00.

To those engineers who must deal largely with the collection of topographic data this little manual will be found unusually useful. The method of surveying that is made the basis of the diagram for computation in the reduction of stadia notes has been found of great value to the author and others who have tried them. The author is himself an engineer of wide experience and one well known to the profession. The book is divided into nine subdivisions of text and includes in addition the stadia diagram in cover pocket. It begins with the development of the telescope for stadia reading, discusses the various formulas in use for stadia computation and ends with practical hints for the platting of stadia notes.

NEW ELECTRICAL DEVELOPMENTS

(Various bills before the legislature in the Northwest are of special interest to the electrical industry. In the Pacific Central District various increases in rates have been allowed by the Railroad Commission, and a reservoir as part of the Hetch Hetchy system is to be built in San Francisco. Considerable activity along electrical lines is reported from irrigation districts and elsewhere throughout the Southwest and Intermountain Districts.—The Editor.)

THE PACIFIC NORTHWEST

TACOMA, WASH.—City officials have reduced street car fare in the city from seven to five cents.

PILOT ROCK, WASH.—The city has secured a plot of ground 50 x 80 feet for the erection of a light plant.

TACOMA, WASH.—The Tacoma Railway & Power Company has paid into the treasury of this city the sum of \$17,269.96 as its gross earnings tax for 1918.

SEATTLE, WASH.—Corporation counsel is drawing a bill to be presented to the legislature that has for its object the securing of permission by the city to go into the jitney business, to be operated in conjunction with municipal street railway lines.

SOUTH BELLINGHAM, WASH.—E. K. Wood Lumber Company of South Bellingham will install a 220 kva. Allis-Chalmers synchronous motor. This motor, in addition to driving three planers, will serve to correct the power factor of the plant.

ESTACADA, ORE.—The high water caused 50 feet of flume, which extends from the dam to the power house of the Portland Light and Power Company's power plant, to go out at Cazadero. By working night and day the repairs were completed promptly, however.

FAIRBANKS, ALASKA.—Fairbanks and Nenana will cooperate in the movement to secure a government-owned hydroelectric plant in the Tanana Valley to provide power to miners and those engaged in other industries. It is proposed to locate the plant on the Nenana.

ASTORIA, ORE.—A resolution has been passed by the Port of Astoria Commission requesting the Pacific Power & Light Company to provide immediate relief to the industries now appealing for electric energy with an adequate surplus to take care of whatever offers during the present.

SEATTLE, WASH.—Plans have been completed for the finishing of the interior of the Seventh avenue and Jefferson street power substation of the Puget Sound Traction, Light & Power Company, which was destroyed by fire November 10, 1918. All-new construction will be fireproof throughout.

SEATTLE, WASH.—Looking to the eventuality of the purchase by the city of the Rainier Valley street car system by Seattle, a bill has been introduced in the state legislature of Washington amending Chapter 59 of the state laws of 1917, giving cities the right to acquire and maintain street railways that extend beyond the corporate limits within a five-mile limit.

MARSHFIELD, ORE.—All street lights were out and no power could be furnished on Jan. 31st to the industrial plants, because of an accident at the Smith mill which made it impossible to furnish electric power. Until repairs were made, lights could be supplied only to residences and for the interior of business houses.

EVERETT, WASH.—This place is to be given a chance in the near future to vote on the question of establishing a municipal light and power plant. The city commission has been quietly planning for several months for development of power on the Sultan river. The first development would call for 6000 horsepower.

KASLO, B. C.—A new hydraulic plant and 2200 feet of pipe line are being installed at the property of the Gibson Mining Company, operating about 12 miles from this place.

A. C. Britnall, formerly of the Washington Water Power Company, is installing the plant and equipment. The property is a silver-lead and zinc proposition.

ASTORIA, ORE.—The Port of Astoria has authorized the sale of an additional series of bonds totaling \$750,000. The money is to be used in proposed extensions during the coming year. Among the improvements contemplated is an export and import pier and warehouse; additional power plant for the industrial growth of the city, etc.

PORTLAND, ORE.—As one of the final steps toward the termination of the receivership which has been in effect since June, 1917, foreclosure sales of the Home Telephone & Telegraph Company's property in Portland, Oregon City, Corvallis and Albany will be held at the court house February 17. The Pacific Telephone & Telegraph Company will bid \$1,950,000 for the property.

PULLMAN, WASH.—Plans for the development of the electrical power from the waters of the Salmon river, 25 miles from Lewiston, were outlined before the Chamber of Commerce by F. S. Rice, who has secured water rights covering the horseshoe bend in the Salmon river and has secured government rights to tunnel through the bend and construct a dam to divert the flow of the water.

SALEM, ORE.—Plans for a \$6,000,000 bond issue by the state of Oregon for the development of the water power of the Deschutes river and the creation of hydroelectric districts which may vote bonds and finance retirement of them when voted are the purposes of a joint resolution introduced recently in the lower house of the Oregon legislature. The resolution provides for the submission of an amendment to Article 19 of the state constitution.

SEATTLE, WASH.—Claiming that the development of the Skagit power project will require many years, Fred. W. Kelly has suggested, in a letter to the city council, that the city make use of the Swan Lake storage reservoir as a means of securing additional electric current quickly. This reservoir, as a part of an elaborate system of extensions planned in the city water system, will store a three months' supply of water. Kelly states that this impounded water can be profitably and economically used by the city to generate electricity.

KLAMATH FALLS, ORE.—A controversy between the California-Oregon Power Company and the water users of the Klamath Irrigation Project seems likely since the announcement by the corporation of its proposed dam across the head of Link river, at the outlet of the Upper Klamath Lake. The water users assert that their contract with the government when the Klamath project was launched, gave them the power rights as well as the water rights when they had paid up their water charges, and they claim that these are being infringed upon.

WENATCHEE, WASH.—Four and one-half feet of the steel pipe that carries the water from the Great Northern dam to its power house in the Tumwater canyon split recently, cutting off the power for the motors that haul the cars through the tunnel on the top of the hill and also putting out of commission all the Great Northern electric lights from Leavenworth to Tye. The pipe is 24 feet in circumference and when full the pressure is 80 pounds to the square inch. It is considerable of an engineering feat to mend such a break so that it will stand the continued pressure.

SEATTLE, WASH.—City Engineer A. H. Dimock estimates that the Skagit river power plant will cost not less than \$30,000,000 when fully developed. The sum of \$80,000 has already been spent in sinking test holes. He states that the recent borings at Gorge creek in an effort to find a suitable base for a concrete dam have not been as satisfactory as those first taken, the depth to bedrock being much greater than anticipated. In summing up the work done to date in his report to the city council it is shown that the transmission survey has been completed from Darrington to Snohomish, a distance of 42 miles. The railroad survey has been completed. Studies are now being carried on to determine the relative cost of construction and operation of a railroad and of the wagon road. Studies are also being made to determine the unit cost of the different parts of the work of constructing the power plant in order that the different methods of development may be readily compared. Topographic surveys of a power house site and of the river from the power house site to mile 21 on the trail—a distance of 5 miles—have been completed. Dimock says surveys of the river canyon and of the Ruby creek reservoir should be completed during the coming season. These surveys are necessary in order to complete the data required by the United States Government prior to issuing either preliminary or final permits.

THE PACIFIC CENTRAL DISTRICT

TULARE, CAL.—The Central California Gas Company will open an office and gas appliance store here.

ALAMEDA, CAL.—The Great Western Power Company is extending its lines into Alameda, to furnish power for the coaling station of the Rolph Shipping Company.

SAN FRANCISCO, CAL.—Tenders have been opened in Washington for an addition to the power plant of the Letterman General Hospital here. The cost is estimated at \$60,000.

MERCED, CAL.—The people of Dos Palos voted in favor of forming a street lighting district. The supervisors will advertise for bids for the installation of ten 80 candle power street lights.

OROVILLE, CAL.—An additional 850 acres was added to the Honcut irrigation district, making a total of 24,000 acres of Butte county and Yuba county land that is to be irrigated by the proposed new system.

RED BLUFF, CAL.—The city trustees closed a lighting contract with the Northern California Power Company, in which it is agreed to furnish electricity for lighting the streets of the city for \$200 per month for a period of one year.

SAN FRANCISCO, CAL.—The expenditure of \$45,000 for the reconstruction of United Railroad tracks on Taraval street, between 20th and 23rd avenues, was authorized by the Board of Supervisors. Construction will be completed in forty days.

PETALUMA, CAL.—The United States Government has taken over the Marconi wireless station at Marshalls and in a few weeks it will be remodeled. With the new process installed it is said that the efficiency of the plant will be increased 40 per cent. Improvements are also to be made in the sending station at Bolinas.

SAN FRANCISCO, CAL.—Pacific Gas & Electric Company has announced the declaration of the regular quarterly dividend of \$1.50 a share on the first preferred and the original preferred stock. This disbursement is payable on February 15, on stock of record January 31.

SAN FRANCISCO, CAL.—Condemnation proceedings for a big Hetch Hetchy reservoir site within the confines of the city will be started by the city within the next few days. This was decided upon at a meeting in the mayor's office several days ago and agreed to by the supervisors' public utilities committee at a special session in the city engineer's office.

MANTON, CAL.—The Northern California Power Company has purchased outright the water rights of Mary S. Allen in the Hackler ditch. The power company recently has purchased many large water rights in this section. It is believed that this indicates an enlargement of the generating capacity of the company's power plant near here.

WILLOWS, CAL.—Claiming that the West Side Canal Company could not guarantee a sufficient water supply for rice irrigation next year unless funds were provided for increasing the pumping plant capacity, the company officials asked rice growers of Glenn and Colusa counties to agree to an increase in water rate of approximately \$4 an acre.

AMADOR CITY, CAL.—The Railroad Commission has issued an order allowing the Amador Electric Light and Power Company to increase its rates. The company showed that the cost of creating power and rendering service had increased materially owing to war conditions. It is estimated that the new rates will provide the company with an operating revenue of \$39,472.

SAN FRANCISCO, CAL.—Dr. Washington Dodge has resigned as president of the Federal Telegraph Company and R. P. Schwerin was elected to the vacant chair. Simultaneously, E. W. Hopkins resigned as vice-president and the other directors resigned, their places being filled by Leon Bocqueraz of the French-American Bank of Savings, and T. C. Tognazzini of the Anglo California Trust Company.

SACRAMENTO, CAL.—Submission of a bond issue for \$5,000,000 to the voters for the building of dams for flood water control is the nub of a bill introduced in the Assembly by Hurley of Oakland. He proposes that the state shall build reservoirs under the direction of the State Water Commission for the impounding and conservation of the water supply. He would utilize this water as needs be for irrigation and hydroelectric power.

STOCKTON, CAL.—Directors of the Modesto and Turlock Irrigation Districts have received a final report from Consulting Engineer A. J. Wiley of Idaho, and have his estimates and recommendations for the construction of the Don Pedro dam, reservoir and power plant in the upper Tuolumne river at a cost of \$3,489,000. The Modesto and Turlock districts will build the project, standing for the cost at a third and two-thirds ratio.

WOODLAND, CAL.—Rice growers in Yolo county will loan the Yolo Water and Power Company the sum of \$40,000 as financial assistance in completing its irrigation system this season. The company lost heavily in 1918. The United States Food Administration ordered the company to install a big pumping plant at Lower Lake with which to force water from Lake county upon rice lands in Yolo county. The two million dollar rice crop was saved, but the water company lost money.

SACRAMENTO, CAL.—Preliminary surveys for the Iron Canyon project, which has been given Federal assistance, will be under way in the Sacramento valley in the very near future, is the belief of W. A. Beard, secretary-manager of the Sacramento Valley Development Association, who announces that state funds to the extent of \$5000 now are available. Another \$10,000 from private sources also has been pledged in the Sacramento valley. Secretary of the Interior Franklin K. Lane some time ago gave Beard promise of \$10,000 of Federal moneys if \$12,000 were raised in California.

YUBA CITY, CAL.—The State Railroad Commission has authorized the Middle Yuba Hydro-Electric Company to increase its power rates to meet operating expenses and provide a reasonable return on its investment. The company is not permitted to change its lighting rates. It serves eleven mining companies in Allegheny and Forest and buys its energy from the Pacific Gas & Electric Company. Its plant the Commission values at \$60,061. During the last fiscal

year, the company says, it earned 1.27 per cent and in July, August and September of last year met a deficit of \$937. The new rates are arranged to give the company a return of 7 per cent.

WILLOWS, CAL.—Contracts have been let during the past few days for ten large pumping outfits, consisting of wells, pumps and electric motors, all of which will be operated for water development purposes in connection with the rice industry. Hugh Garnett will have eight of these plants, two of which have already been installed, while the remainder have been contracted for. Three of these will be installed on his Germantown ranch and three more on the Garnett and Willard ranch southeast of this city. With these plants he hopes to irrigate his entire holdings. Several others of the large land owners are considering the development of underground supplies.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—The Board of Public Works has issued orders that the owners of the Mt. Washington Railway equip their line with new cables at once.

HOLBROOK, ARIZ.—A recent fire entirely destroyed the building occupied by L. Caldwell Company and the Navajo-Apache Telephone System, the damage amounting to \$30,000.

EL CENTRO, CAL.—The Holton Power Company contemplates the expenditure of \$35,000 or more on valley improvements this year, among them a second line from El Centro to Calexico.

LOS ANGELES, CAL.—New bids will be asked by the Board of Public Service for the penstock pipe to be used at Power Plant No. 2 in San Francisquito Canyon, previous bids being too high.

LOS ANGELES, CAL.—A proposal to buy the Pasadena electric system of the Southern California Edison Company for \$510,108.32—if people will vote necessary bonds—has been formally made.

FLORENCE, ARIZ.—Burns & McDonnell, consulting engineers, Interstate building, Kansas City, Mo., are preparing plans for a new municipal waterworks system and lighting improvements for Florence, at an estimated cost of \$80,000.

BRAWLEY, CAL.—The Southern Sierras Power Company will rebuild the lines from Bishop to Inyo, to raise the voltage from 55,000 to 87,000, at an expenditure of \$300,000, according to Chief Engineer C. O. Poole. This will go through Brawley and Calexico.

SUPERIOR, ARIZ.—The Queen Creek Copper Company is figuring on the installation of a power plant which will include a 100 h.p. engine and a new compressor and hoist. Specifications are being prepared. W. E. Defty, consulting engineer and Mr. Stephen, president of the company, are at the plant looking over the situation.

TOMBSTONE, ARIZ.—Sealed bids will be received by the Board of Supervisors, f.o.b. Tombstone, for one complete electric light and power plant to furnish ample and sufficient power for 60-watt lamps to be used for lighting and furnishing power for the court house at Tombstone. The power plant must be in accordance with all necessary requirements of the board of underwriters.

LOS ANGELES, CAL.—Application has been made to the Board of Supervisors of Los Angeles county for a franchise granting a right to lay, maintain and operate for a period of 40 years, a system of pipe lines for the transportation of oil and gas along Mesa Drive, Hill Drive, San Gabriel Boulevard, Durfee Avenue, Lexington and Gallatin Road, and certain unnamed roads of E. J. Baldwin's second subdivision. Sealed bids will be received at the office of the Board of Supervisors up to March 3, 1919.

NEEDLES, ARIZ.—The Needles Gas and Electric Company has requested the Railroad Commission to order the Needles Ice Company to discontinue the sale of electric energy to the Murphy Water, Ice and Light Company, claiming that the ice company has installed a plant and strung wires to the Murphy plant and is about to operate as a public utility without having obtained the consent of the Railroad Commission, therefore in violation of the public utilities act.

THE INTER-MOUNTAIN DISTRICT

BRIGHAM CITY, UTAH.—The Brigham Natural Gas & Oil Company has been incorporated here for \$500,000, by C. M. North, W. S. White, Charles Reeves and P. H. Ball.

OGDEN, UTAH.—The Oneida Irrigation District in Southern Idaho and the Amalgamated Sugar Company of Ogden are to complete the Oneida Canal at a cost of \$400,000.

LOVELOCK, NEV.—The Woolsey Light & Power Company has sold to the Nevada Valley Power Company their electric system for the town of Lovelock. They will take over the business on the first of March.

PRESTON, IDA.—The trustees of Fairview, Idaho, have granted the Utah Power & Light Company a franchise until December 1, 1968, to construct and operate electric light and power lines for the purpose of supplying electricity to the village.

OGDEN, UTAH.—A communication from a Kansas City firm offering to furnish special plans and specifications for the proposed new municipal electric lighting plant was read before the city commissioners. The communication was referred to the city engineer for investigation into the merits of the proposition.

CALDWELL, IDA.—Among the business buildings that will be constructed in this city in the near future will be a large two-story brick as a depot building for the Caldwell Traction Company. Plans have been drawn by R. E. Field, local architect. The building will be 50 x 75 feet. R. W. Sebree is president of the traction company.

BOISE, IDA.—That the Utah Power & Light Company, through its predecessor, obtained use of the waters of Bear River and Bear Lake in Idaho under false pretenses by diverting the water to power uses instead of using it for irrigation purposes as agreed, is declared by the Idaho State Federation of Labor in a communication transmitted to the legislature of Idaho.

BOISE, IDA.—The keystone Dredging Company of San Francisco has purchased about 800 acres of placer ground on the Boise and Feather rivers near Featherville, including what has been known as the Old Junction Bar. The property is to be equipped at once with two of the largest dredges ever installed in the state. The total investment for the ground, dredges and power will be \$800,000.

BOISE, IDA.—Changes in the administration of irrigation waters in Idaho are provided for in a bill framed at Twin Falls by delegates to the Idaho Irrigation Congress. The measure, which will be presented to the legislature, proposed the creation of a bureau of water rights, the members of which shall be appointive, and shall hold office for nine years at an annual salary of \$7500. Continuity in the personnel of the board is especially desired.

PUEBLO, COL.—At the South Side water works at Pueblo, Colorado, during the year 1918 an electrically driven, direct connected pump of a capacity of 3,000,000 gallons daily was installed. The city is now preparing to install a second unit with 6,000,000 gallons daily capacity, and it is the intention of the trustees to electrify the entire pumping system during 1919. All of the energy is supplied by the Arkansas Valley Railway, Light & Power Company. The trustees estimate an annual saving of \$10,000 when the plant is completely equipped for electrical operation.

THE VACUUM CLEANER — THE VACUUM CLEANER

SAVING THE WASTE has come to be the slogan of the hour and—with no disparagement of the material here presented—that is the object of these columns. Many a good thing on account of its diminutive size gets lost behind the couch—and it is only by emptying the contents of the Vacuum Cleaner's bag in public that its virtues are appreciated. Here are some of the collar buttons and twenty-dollar gold pieces that the Office janitor has accumulated.—The Editor.



To receive a postcard from Germany these days is like receiving a message from the departed. This however, is a greeting from the newly arrived. P. H. Manchester, brother of Chester Manchester of the Economy Fuse Company, writes to the Journal of



Electricity from Hayingen, Germany, under date of Nov. 30, 1918. He says on the back of the card here shown:

I visited a large steel plant in this town today which had two steam turbines generating power for the plant, also lighting up this town. I noted American instruments (Weston) were on the switchboards. Most of the furnaces were also of American make. The electrical work in this country is more up to date than in France. P. H. MANCHESTER.

Why young men come West is explained in the following delightful poem which appeared recently in the "Spectator," Portland, Oregon. The West is willing to agree that most good things came out of the East, you see—but they accent the fact that they came out.

WHERE THE DREAMS COME TRUE
Men look to the East for the dawning things
For the light of the rising sun;
But they look to the West, the crimson sun,
For the things that are done,—are done.
The Eastward sun is a new-made hope
From the dark of the night distilled,
But the Westward sun is the sunset sun—
The sign of a hope fulfilled.
For out of the East they have always come—
The cradles that saw the birth
Of all the heart-warm hopes of men,
Of all the hopes of earth.
For out of the East a Christ arose,
And out of the East there gleamed
The dearest dream and the clearest dream
That ever a prophet dreamed.
And into the waiting West they go,
With their dream child of the East,
And find the hopes they hoped of old
A thousand fold increased;
For there in the East we dreamed the dreams
Of the things we hoped to do;
But here in the West—the crimson West—
The dreams of the East come true.

DOUGLAS MALLOCK.

A new use for electric bulbs is suggested by the following quotation from "Now and Then," a little four-page publication gotten out occasionally for the benefit of members of the Business and Professional Women's Club of San Francisco. This issue is entitled "The Women's Friend" and is a take-off on some of the magazines which confine themselves to the more proverbial "woman's sphere." The following appears under Household Hints and is inserted in honor of Miss H. R. McDonald of the San Francisco office of the General Electric Company, who is a member of the club:

"Don't throw away your General Electric light bulbs after they are worn out. Keep them in a neat basket beside your bed for a burglar alarm. When thrown against the floor or wall they explode with a loud alarm equal to a six-shooter, and will scare away the most daring robber. They are also invaluable for discouraging prowling cats."

Banking difficulties in Manitoba are reported to affect the gas and electric industry. One of the men in Ontario from whom the Dominion Natural Gas Company leases some land, has moved to Manitoba and his rental checks have been sent there. Apparently banking facilities in Manitoba are radically different from those in Ontario, as the following letter will indicate:

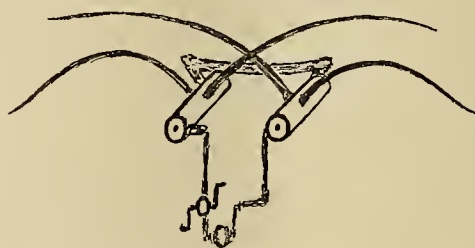
please gentlemen send me a postoffice for the time to come i have a hard job to get them checks cashed if you was to make them payable at any bank in canada they would be all right i do not no of a molston bank in manitoba and there is a dose of B.S. every time and 25c you do not no how scart the banks is out hear and Oblige.

A trip to India usually does not pass unnoticed, but those who read the following item—last week—in the maritime section of the San Francisco Chronicle were in doubt as to whether they had overlooked an oriental trip of the editor. Mr. Sibley was recently in the East—but not the Far East, so far as the Vacuum Cleaner can learn. At any rate, he was absent but little more than two weeks. Further solution of the mystery is not available to date.

J. Frederick Gale, importer of New York and Calcutta, arrived as a passenger on the Pacific Mail liner Colusa from Calcutta and Singapore yesterday with a scar on the side of his head, and the other twenty-four passengers chuckled as they told how the injury was received. It seems that time hung heavily on the hands of the passengers as the ship was steaming through the tropics and Gale then hit upon a new game which he called "Soakem." He and the following passengers each provided themselves with a rolled up newspaper or magazine: Louis C. Morse, Robert Sibley and a few others from San Francisco. The game was for each to hit the other fellow with the paper as softly or as hard as each pleased. Gale was the recipient of a vicious accidental blow that laid the scalp open and then the game stopped.

ENGINEERS OF YESTERDAY—3. LEONARDO DA VINCI

(A Series Compiled by A. L. Jordan)



Is this a bird with four wings?

No, it is a reproduction of a sketch by Leonardo da Vinci (the famous Italian painter and sculptor), showing that plans for a heavier-than-air flying machine had been made in about 1600. He also discovered persistence of vision (a spark on the end of a stick revolved rapidly, giving the appearance of a circle), which is the beginning of the story of moving pictures; invented engines for offensive and defensive warfare, canal locks and other industrial appliances.

In This Issue: Electric Railway Problems in the West

JOURNAL OF ELECTRICITY

VOL. 42 NO. 5

SAN FRANCISCO, MARCH 1, 1919

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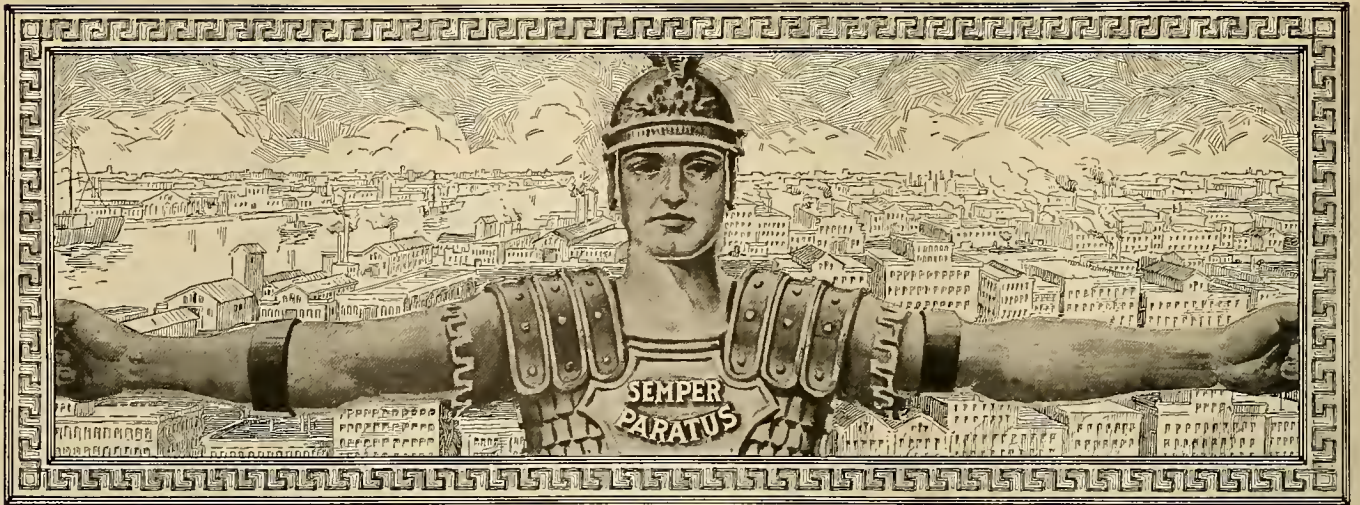
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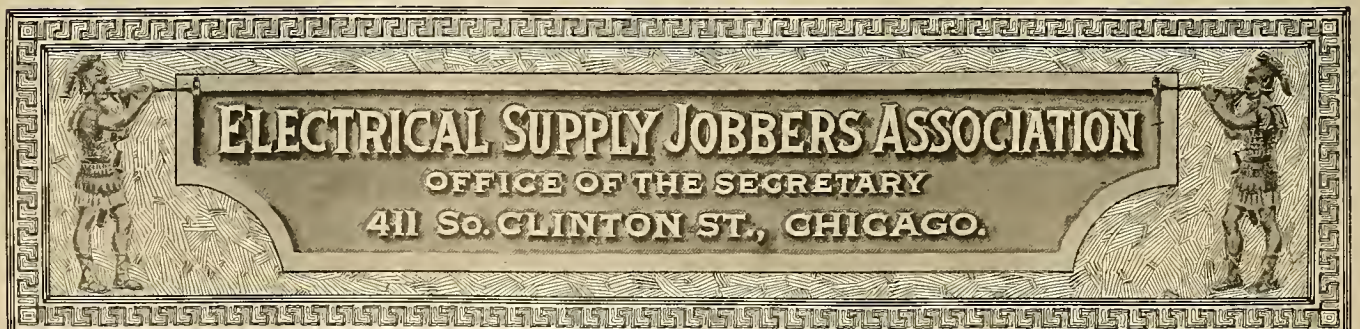
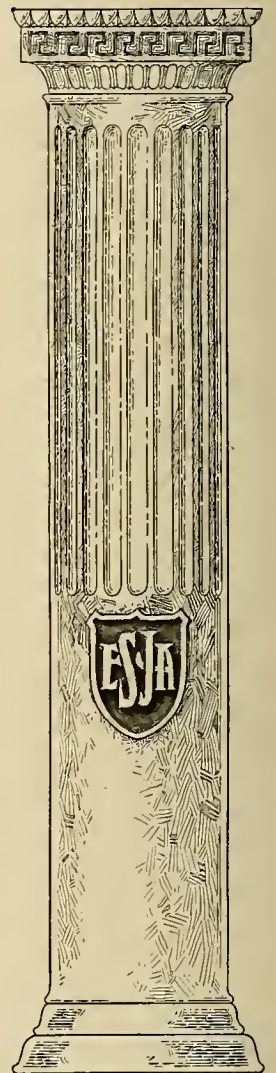
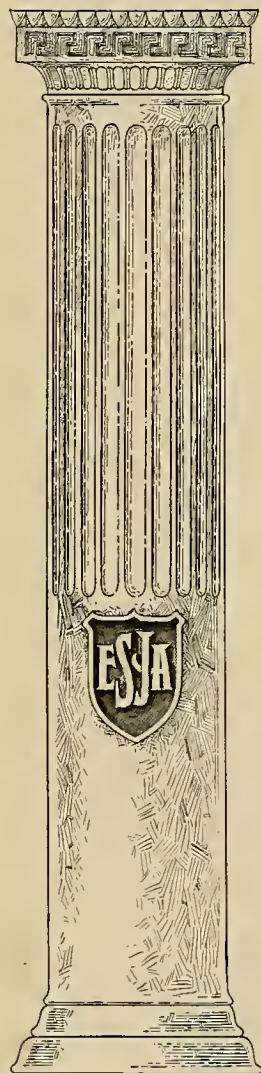


MANUFACTURERS seeking new outlets, and the trade, looking for dependable sources of supply, meet in the service of the Jobber. "Semper Paratus" — always prepared — with warehousing facilities accumulating vast stores gathered from many directions for distribution in smaller consignments, economically, speedily and reliably.

Jobber distribution means established and stabilized demand for the manufacturer. For the buyer it means intimate contact with a wide range of material and direct responsibility for each element of purchase, no matter how conglomerate an order may be.

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, MARCH 1, 1919

NUMBER 5

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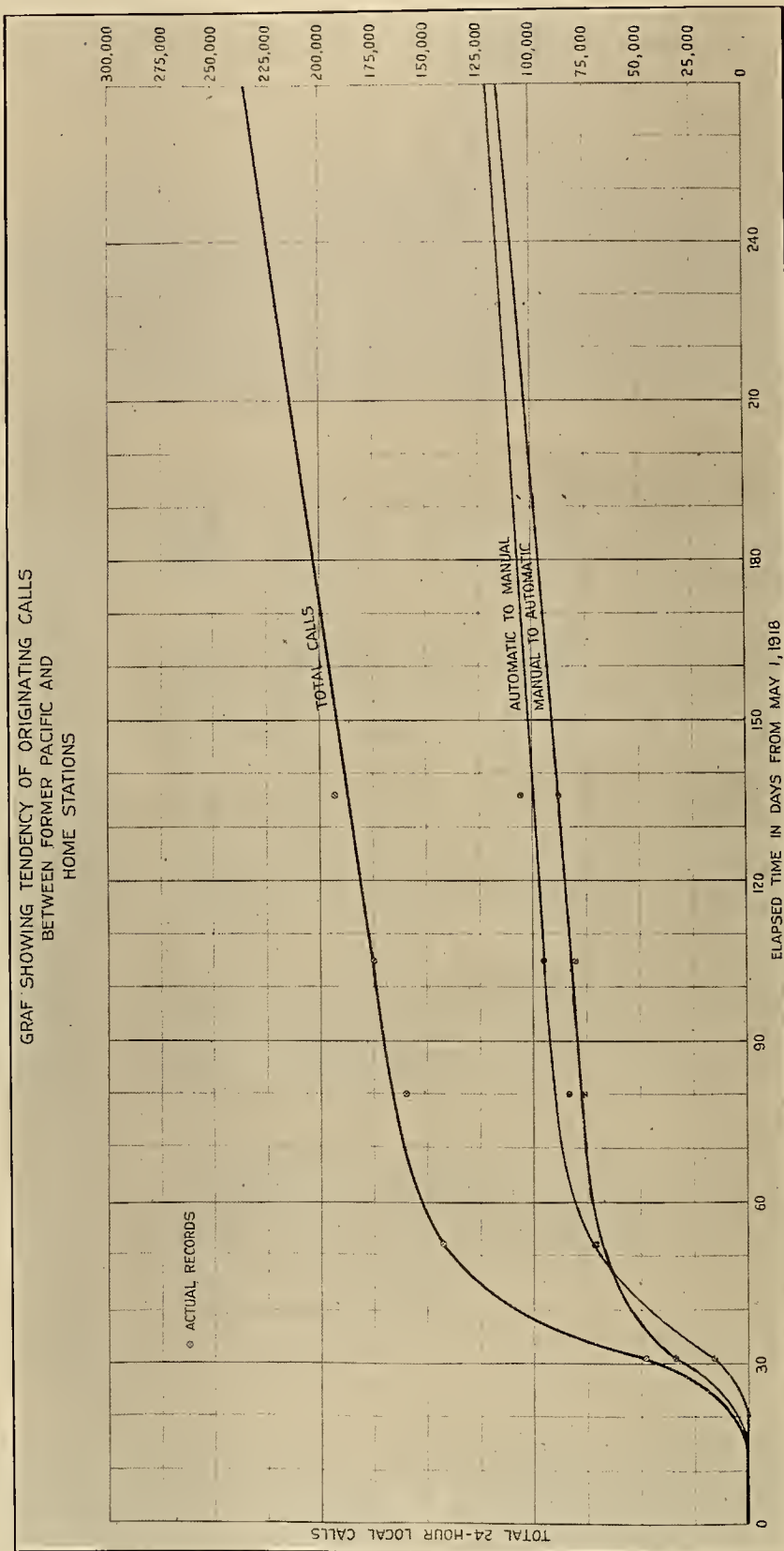
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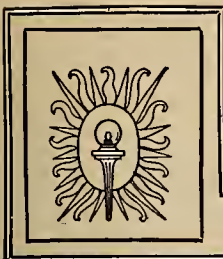
ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER

GRAF SHOWING TENDENCY OF ORIGINATING CALLS
BETWEEN FORMER PACIFIC AND
HOME STATIONS



ANOTHER WORLD'S RECORD IN THE METHOD ELECTRICAL AT LOS ANGELES

The largest and most extensive automatic system of telephones in the world, situated in a city that had the largest density of telephone installation per capita in the world has now been thrown into operation and its activities coordinated with universal telephone service available throughout the entire United States. So accurate proved the forecasting of the increase in telephone service that the curve shown above, projected from observations up to the 192nd day, was found to tally exactly on the 228th day when an actual count was made. Such achievements as the great interconnection at Los Angeles in telephone accomplishment but again establish the supremacy of the method electrical in the West where electricity is used per capita of population to a degree not even approached by any other district in the world.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, MARCH 1, 1919

Number 5

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The League of Nations

As in the business world true cooperation demands a unification and coordination of service, merchandising methods and ethical ideas that business may the better serve the demands of human society, so in the formation of the League of Nations we must anticipate that the same refining process will be necessary—but the vast possibilities such a move offers for the forwarding of the permanent peace and prosperity of the world as a unit so overshadow all arguments that may be advanced against it as to convince thoughtful men that the one awe-inspiring and enduring outcome of this terrible experience through which the entire world has just passed is this possible accomplishment of a League of Nations based on a longing in the human breast so sacred and almost so unbelievable of attainment that one almost dare not utter it, yet now it appears within the grasp of possibility.

In the merging of the largest automatic system of telephones in the world, the problem so successfully solved at Los Angeles establishes a new record for which the West is justly proud.

**A New Record
in Telephone
Development**

The continual expansion of the universal service idea, so well known as the ideal toward which the Bell system has for years bent its efforts, month by month reveals new wonders in progress.

It was back in the early nineties that the Pacific Coast contributed the final knock-out blow to the former magnetic ring-in system and made possible the calling of the operator by simply taking the receiver off the hook. There followed extensions and improvements in other lines until at the Panama-Pacific International Exposition in 1915 the great transcontinental trunk lines were opened with demonstrations between San Francisco and New York. And finally, just prior to the entrance of the United States into the world war, Secretary Daniels at his desk in Washington was able to communicate intelligence to the Eiffel Tower in Paris and to the giant station in the Hawaiian Islands, from where it is reported the effect was registered in far-off Japan.

Coming back to telephone development in the West, it is generally understood that nowhere else in the world are telephone installations more intensive than at San Francisco and Los Angeles.

Only those who have been abroad and experienced the vast difference between the accuracy and rapidity of service connection prevailing in this country and foreign countries can appreciate the daily blessings enjoyed by its citizenry.

While the expenditure of the million and one-quarter dollars in Los Angeles in addition to considerable increases in operating costs has been made without in any manner raising the telephone rates prevailing prior to the interconnection, the breadth

of service has been vastly widened—in fact, a service that now, less than ten months after the interconnection, will total over a quarter of a million additional calls per day, has already developed.

The article of Mr. Wiseman appearing elsewhere in this issue, on the remarkable interconnection feat at Los Angeles, will unquestionably be read with great interest and the Bell system as a whole may well be congratulated upon the accomplishments of this new engineering advance in the West.

It is with unusual gratification that word has been received concerning Western genius again receiving world-wide recognition.

A New Advance in Electro- Chemistry

Dr. Frederick G. Cottrell, known to the West as the inventor of a process for electrostatic dust precipitation, has recently been awarded the Perkin medal for distinguished service in chemical research. In accepting the honor Dr. Cottrell, who is now chief metallurgist of the U. S. Bureau of Mines, outlined some interesting investigations that are now being undertaken under his direction that will in all probability result in a real revolution in the fundamental industries of the country—namely, the production of helium and oxygen by vastly improved economic processes. Helium is a non-inflammable gas heretofore not available in large quantities, which it is proposed to use in balloons, and which it is anticipated may make transportation by dirigible a fairly safe proposition. Oxygen on the other hand enters so largely into countless industrial processes as to make its economic production a matter of prime importance in the industrial life of the nation. This advance in electro-chemic research will as a consequence be watched with unusual interest from many quarters.

It is interesting to briefly review the great accomplishments already attained by the so-called

Cottrell process of dust precipitation. Due to the discovery of Dr. Cottrell that small particles in chimney gases exposed to a strong magnetic field become electrostatically charged and consequently travel at right angles to the movement of the chimney gases as a whole, a practical application has been made by him which is accomplishing vast economic savings.

One of the interesting features of the process is that, although developed solely to prevent a nuisance, it frequently proves most profitable financially. For instance, it is stated on good authority that a copper-smelting company installed a precipitating plant at a cost of \$113,900. The operating expenses were \$14,600 per year but the copper-dust collected proved to have a value of \$180,018.

Such achievements as this merit the praise and admiration of all beholders and the West is proud to claim this noted inventor among its builders.

An unusually interesting deduction may be made from some facts in regard to the reconstruction period during and after our Civil War that have recently been compiled by a prominent manufacturer of electric appliances.

The Recovery of Business

These, if carefully interpreted, may aid in casting considerable light on the present status of business and some estimate of the relationship of business volume, cost of labor and general prosperity forecasted. From 1860 to 1865 the business of the North was as prosperous as business in this country from 1914 up to the present time. During both periods business operated on a rising market. From 1865 to 1873, American business operating on a falling market, enjoyed the greatest prosperity it had ever experienced up to that time. At the conclusion of the Civil War prices began to decline and wages continued to increase for seven years after the conclusion of the war. In the period from 1860 to 1865, and from then on there was an almost uninterrupted decline, the index number for 1880 standing at only 4% above the level for 1860. Wages on the other hand rose more slowly during the war period and continued to rise generally until July, 1872, seven years after prices had begun the long decline. The margin of gains for the workers, the net increase in real wages, maintained at the close of the 20-year period, can be roughly measured by the indices, which show a gross gain of 38% in wages over the 1860 level, against a net increase of 4% in wholesale prices.

It is particularly illuminating to note carefully the above statement that although operating on a falling market from 1865 to 1873 yet American business enjoyed the greatest prosperity ever experienced up to that time. If we carefully examine into the industrial and technical progress of that day the real reason for this may be easily found. New inventions and new economies were brought to light on all sides and the technical brain power exerted during the stress of war bore abundant fruitage on every side immediately following the war period.

And unquestionably the period of world development now ahead will experience a thrill and advance never before accomplished in the world's his-

tory, due in large measure to this same cause. Already the forewarning is heard in many quarters. The recent announcement by the Bureau of Mines of possible vast economic reductions in cost of oxygen production is but one instance. On all sides new uses and new processes for fuel manufacture are heard each day. The aeroplane, with the thirty thousand young brains trained in its service, means new fields of usefulness that must imprint its influence upon the next score of years ahead. Telegraphy, telephony and radio service are in new and interesting phases of advancement day by day. Ship building and newly applied arts such as electro welding are working new wonders. And the beginning is only here. A year or so from now, when the splendid inventive power of this nation is again fully relaxed into peaceful channels of application, economic savings and new processes of manufacture will be brought to light never before thought possible of accomplishment. And this inventive era ahead is but one phase of the many good things in store. Indeed, the general business outlook is more promising for American enterprise from many new points than ever before experienced in its eventful history. And in all this promise of good things electricity and its manifold uses will play the major role.

The electrical industry in the West finds itself confronted with the returned soldier problem to an enlarged degree. Thousands of

The Returned Soldier Problem young men who have visited the West and have been stationed at the various camps in this attractive

section of the nation have become enamored with the enthusiasm, newness of life and future possibilities of this section. In one city alone three thousand discharged soldiers, formerly residents of other states, have literally set themselves down in this particular city and decided that the place looks good to them. While this choice of residence is most complimentary to the West it at the same time has placed a burden upon the business life of the community that for some months to come will not prove easy to bear.

All agree that every possible effort must be made at once to assist our splendid young men, who have so wonderfully met the hours of crisis in our national life, in giving to them the very best that we have to offer.

But it is for the greater good to all that sane and thoughtful choice be used in starting again the wheels of industry to meet peace time conditions. In view of the increasing congestion in the business and industrial life of the West, due to such large numbers of men appearing in fields where employment should first be given to the men who here left their positions to go to war, would it not be wise to spread the idea that every man should upon being discharged seek first the former city and place of occupation? A few months will work wonders in readjustment and this seems the most direct method of bringing about the quickest results, and a method that will involve the least confusion and loss of time in readjustment.

The electric street railway industry for several years past has been confronted with disheartening problems arising from unforeseen competition, such as the jitney, a reduction of revenue due to a change in riding habits of persons acquiring automobiles, frequently referred to as "competition of the private automobile," the failure of light feeder and pioneer lines to develop traffic in keeping with original predictions when projected, and the inability to secure general public recognition that five cent fares in the face of increased cost of labor and materials, longer hauls and better service, must give way in many cases to radical increase.

From these adversities have sprung new theories and practices which in the ultimate will tend to strengthen the position of the electric railway industry. Due to the sentimental nickel standard, few electric railways have been able to pay dividends, to say nothing of the inability to handle the subject of depreciation and reserves which would permit the needed modernization of much equipment which would result in many economies. The exigencies of the war period have seen public utility regulatory bodies over the entire country granting fare increases in many cities, ranging from 1c to 5c above the sentimental nickel standard. In many hearings in such matters it has been emphasized that electric street railway systems are without parallel in the economical and efficient transportation of large numbers of people and with a minimum occupancy of street area per passenger foot and maximum safety of operation. In some cases such as the classic Bay State Railway decision of the Massachusetts Public Utility Commission, the demand of the utility for higher fares was met by the suggestion of remonstrants that operating costs might be materially reduced and service improved by the use of the modern light weight one-man safety car. The importance of this case to the public and to the electric railway industry prompts us to publish the decision in this issue on page 225.

Probably no improvement in electric railway car equipment introduced since the "Pay as You Enter" principle holds so much promise to the public and the railroad alike. The cars are extremely light, weighing from 12,000 to 15,000 lbs. fully equipped, and seating from 32 to 40 people. They are equipped with ball or roller bearings throughout and extremely light but sturdy motor and air brake equipment. The controllers are equipped with "dead

man" handle features which insure absolute safety of operation if the motorman becomes incapacitated as the car is brought to an emergency stop, the power being thrown off and air on while tracks are sanded and car doors opened at front and rear end if desired.

Some of the outstanding advantages of this class of equipment are as follows: With practically the same operating expenses, the railroad may operate twice the number of cars over a given line, thereby reducing the headway one-half. It has been demonstrated in many instances that reducing the time interval between cars increases the riding habit of the public.

The power, labor and maintenance per car mile is reduced as compared with older types of cars. The track maintenance, as well as the weight of rails, for light traffic feeder line are reduced. Since the cars are extremely light, they can be handled easier and faster schedule maintained more safely than with the old type equipment. Where the public has become accustomed to the car there is a unanimous opinion that the car is "getting there." This faster handling of the car tends to overcome the impatience of the modern traveling public which is inclined to the opinion in some cases that a five cent fare should give them the equivalent of individual taxi service.

This type of car is now used on over 130 railways throughout the country and has been endorsed for use, when suitable, by the most conservative public service commissions, including Wisconsin, Massachusetts, New York, as well as California. This car was primarily adopted by the Stone & Webster Corporation for its various electric railway properties, including Seattle, Tacoma, and Fort Worth. It is not, however, to be considered as a panacea for all electric railway traffic difficulties, and it should be fairly stated that this type of car is intended solely for light and medium traffic lines. Some operating men who have had experience with the equipment contend that the car should be generally used on many city systems in towns ranging from 50,000 to 75,000 inhabitants.

No other single subject pertaining to electric street railway equipment and operating problems has received more careful treatment than this during the past three years and to parties, whether of the public, labor or railway fraternity, earnestly desiring facts prepared judicially, we commend a careful study of the Massachusetts decision referred to above.

THE NEW JOURNAL SERVICE: What do you know about electricity? Can you explain simple circuits, losses, power and efficiency, wiring calculations, how generators and motors are installed, how they work, what efficiency means and how to calculate it, and how current for electric lighting and heating is estimated? In the issue of the Journal of Electricity for March 15, 1919, will be initiated the text for a correspondence course under the direction of the Extension Division of the University of California, prepared by H. H. Bliss, in charge of technical instruction. In previous years over a thousand have sought aid of this sort from the University. The former work has been revised and the Journal of Electricity is assisting in forwarding this splendid new work in every way possible. The movement also has the unanimous endorsement of the Advisory Committee of the California Electrical Cooperative Campaign. Spread the news everywhere to linemen, operators, telephone workers, electrical contractors and dealers, jobber salesmen—in fact, everyone interested in perfecting his efficiency in the elementary technical grasp of matters electrical. Full particulars may be gotten by addressing either the Journal of Electricity or the Extension Division, University of California, Berkeley.

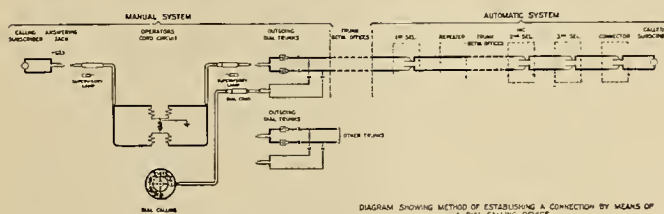
UNIFICATION OF TELEPHONE SYSTEMS

BY D. E. WISEMAN

(The unification of the manual and automatic telephone systems in Los Angeles is remarkable from many standpoints. The two systems had been operating side by side for over 16 years, the automatic system was the largest of its type in the country and Los Angeles had more telephones per capita than any other city in the world. The following article formed the substance of an address delivered before the San Francisco Section A. I. E. E. by the author, who is plant engineer with the Pacific Telephone & Telegraph Company, with headquarters at San Francisco.—The Editor.)

In telephone engineering and the resultant physical and economic accomplishment, June 1, 1918 figures prominently, for on that date the formal union of the Bell Manual telephone system operated by The Pacific Telephone and Telegraph Company, and the Automatic Electric system operated by the Home Telephone and Telegraph Company in the city of Los Angeles, was effected under the management of the newly created Southern California Telephone Company, giving to every telephone user in that area a unified and unrestricted exchange telephone

service. Negotiations were begun and various proposals were considered by all concerned in an effort to avoid any waste or arbitrary measures. A plan was finally accepted for the organization of a local telephone company, which was to purchase the properties of the existing operating companies and unify the service, continuing with the equipments then in plant and giving the right to the telephone users to determine for themselves whether they would retain their automatic stations or manual stations. War conditions imposed restrictions in the conservation of materials and men for such projects and called for a careful weighing of the expected benefits and expenditures of materials and labor.



FROM MANUAL TO AUTOMATIC

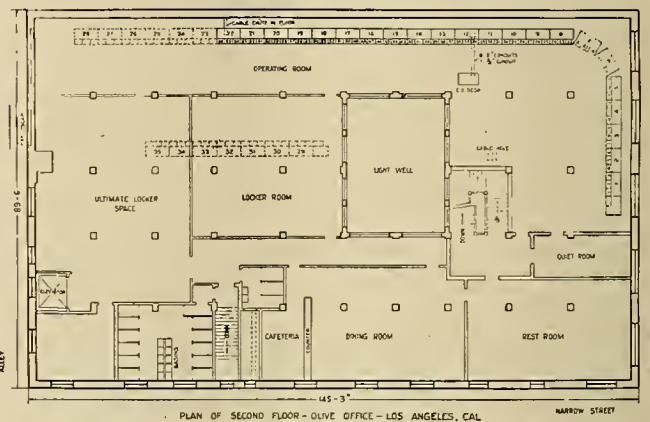
Calls from manual stations are operated by removing the receiver which calls the operator who obtains the number called for and operates the dial accordingly, thereby completing the connection direct.

service and universal service over toll trunk lines to some eleven million telephones throughout the United States. Consolidations of this character have been made prior to this date but involving relatively small volumes of traffic and simple operating methods, so that there were no records of actual performance or established engineering practice to serve as a precedent and guide for determining the effect of and the physical requirements necessitated by the sudden release of two large, distinct and separately bound volumes of traffic into a common channel.

Because of the novel operating and construction methods and the speculative possibilities involved in the important pioneering work of welding these fundamentally different telephone switching systems into a single eighteen-million dollar plant serving 129,000 stations, a semi-technical summary of the events has been prepared for general information and is presented herewith.

Conditions Leading Up to Consolidation

A brief reference to the conditions which brought about the consolidation will be made in order to better understand the problems that confronted the two competing telephone companies and their subscribers. Believing that competition instead of control was the automatic remedy to apply to public utilities, the city of Los Angeles invited telephone competition about sixteen years ago and then struggled along with her business firms and many of her residents paying two telephone bills for a divided and what proved to be an unsatisfactory telephone service. This condition was continued until the year



THE OLIVE OFFICE

The largest single project in the entire undertaking was the design and manufacture of the 66 position special tandem switchboard for the translation of calls from automatic stations to manual stations in the downtown area. The diagram shows the second floor with locker rooms, cafeteria, etc.

With this clear understanding of the requirements, a joint committee of engineering representatives was appointed to determine the methods for the physical joining of the two systems. As a result of these efforts, a fundamental plan, together with preliminary estimates of cost, was submitted and formally approved by the city of Los Angeles, the Railroad Commission of the State of California and by the Attorney General for the Federal Government, and on May 1, 1917, formal authorization was given to proceed with the project.

Differences in Equipment and Methods

In order to picture the plants as they existed prior to the consolidation, I shall refer briefly to the physical properties and the operating methods of the two systems.

As at May 1, 1917, the Pacific Company's exchange consisted of its standard outside plant and station equipment and nine manually operated cen-

tral offices serving about 69,000 stations. Bell equipment was used in units having a capacity of 9,600 multiple lines. Telephone connections were established generally by the calling subscriber removing the receiver from the switch hook, causing a light to appear before an answering "A" operator, who upon receiving a request for a particular number cut-in on an order wire to the particular switchboard unit in the district, indicated by the prefix of the number called for. An operator at the distant switchboard unit, assigned a trunk over this order wire to the calling "A" operator and completed the connection by plugging into the called-for subscriber's multiple.

The former Home Company operated an automatic exchange including a parallel and similarly constructed outside plant and 14 offices serving a total of approximately 60,000 stations. About 35,000 stations were equipped with dials and approximately 25,000 manual stations operated from private branch exchanges and as public pay stations. The lines from the manual stations terminated on a 45 position manual switchboard in the Olive office. Calls from automatic stations to automatic stations were made by dialing five or six digits, as required, to reach the particular district and individual subscriber. In capacity the former Home plant was one of the largest and probably the most successfully operated of any automatic system installed in the United States or abroad. Home Company private branch exchange subscribers were reached by dialing the private branch exchange operator, who completed the connection. Calls outgoing from private branch exchange subscribers were trunked to the manual transfer board above mentioned, the calls coming in on an automatic trunk distributor which placed each line lamp signal before a non-busy operator. The operator upon taking up these connections would complete the call direct if to another private branch exchange station through the subscriber's multiple or dial the number required, if an automatic station was wanted.

Special Problems

Los Angeles has had the distinction of having more telephones per capita than any other city in the world and is now very close to the top of the list. This general usage is reflected in the number of calls originating in each system, as shown by the records of traffic. The approximate number of daily average calls originating in the former Pacific plant and Home plant was in the vicinity of 430,000 and 420,000 respectively.

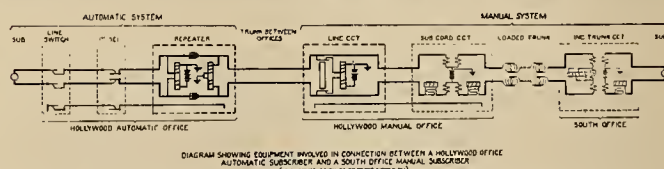
The engineering problems demanded, therefore: A reasonably close approximation of the volume of existing and added traffic which could be expected to flow between the groups of stations of the various districts of the two plants; a determination of the most direct and economical routing of such calls based on efficient operating methods and the use of existing facilities; and the design and development of an inter-unit trunking plant and switching circuits necessary to maintain the commercial standards for transmission and supervision between the

two systems regardless of the mechanical, electrical and operating inequalities. Visual and audible signals peculiar to the separate systems required for supervisory purposes needed to be synchronized or harmonized.

It is obvious that a great many plans and combinations of plans for unification were developed in sufficient detail to determine their relative capital and operating costs and advantages and disadvantages. The plan in principle that was adopted for handling the inter-office traffic between the systems was to operate all existing offices as units of the complete exchange and route the new automatic or manual trunks of each office into the adjacent office of the opposite system, where the connection could be completed by the most direct method and route.

Schedule of Work

Having referred to the facts that were most vital in shaping the project, I should like to outline the organization and schedule of work involved in the construction program estimated to cost one and



CALLING FROM AN AUTOMATIC STATION

Calls from automatic subscribers to manual stations are obtained by operating the digit numbered "9" on the dial. This carries the connection through to the operator in the adjacent branch office who asks for the number desired and then passes the call to a completing trunk operator in the district of the called-for party.

one-quarter millions of dollars. Every reasonable effort was demanded to bring about a unification of the properties without waste of time, and accordingly a complete schedule for the ordering of materials, manufacturing, assembly and installation thereof was set up after a canvass of probable material deliveries and of the labor situation. It became evident that a period of twelve months would be the shortest time possible to complete the necessary work, keeping in mind that war demands might upset the schedule, and all effort was centered on finishing the project within the minimum time. Specifications and plans were completed for each individual project, numbering all together about 110, and each one was charted with due regard to the materials involved, quantity, desired time of delivery and installation and its relation to the project as a whole. As items of material were, of course, duplicated in a great many of the specifications, a master chart was prepared showing the total quantities of each of the thousands of items required at specified dates.

Call Transfer Equipment

The largest single project consisted in the design and manufacture of the 66 position special tandem switchboard and associated equipment to be located in Olive Office for the translation and distribution of calls from automatic stations to manual stations in the downtown area. This switchboard, together with the switching circuits, were designed in detail by the engineers in the general office of the

telephone company, and all of the manufacturing and assembly work was performed in the Western Electric Company shops at San Francisco. Extensive rearrangements of the Olive Office building were necessary to provide space for this equipment and for retiring quarters for the large number of operators required to give the necessary 24-hour continuous service.

In the manual offices it was found to be desirable to equip the regular subscriber positions with a dial for sending out the electrical impulses, and providing outgoing trunks connecting directly with the automatic equipment in the adjacent office. The manual keyboards were badly congested with ringing and listening keys, cords, clearing signal and order wire keys. There were approximately 375 subscriber switchboard positions in the manual system in the Los Angeles exchange that required the installation of this special equipment and associated wiring and this proved to be one of the most difficult parts of the work, because such work had to be performed on positions of switchboard that were in continuous operation.

Expediting the Work

Central office telephone installation work has generally been organized for individual projects usually confined to a particular office building. The plan of scheduling the material and utilizing this material to its greatest advantage made it necessary to depart from the regular practices of the installing forces and to provide that all of the work should be treated as one project wherein the men trained for specific work were to be moved from one office to another as materials arrived and thereby facilitating the completion of the work regardless of irregularities in the arrival of materials for a particular office.

This arrangement was one of the important factors in effecting the final completion of the central office work as at April 30, 1918. The time intervening from this date until the beginning of the delivery of the directory and the formal announcement of consolidation on June 1, 1918, was required in placing thousands of test calls over all combinations of connections to make sure of positive operation. In a typical connection between an automatic and manual station there are 41 relays and 79 from manual to automatic, having movable parts controlling from one to ten electrical contacts, each of which must function in proper sequence from the start to the completion of each telephone call. I do not wish to convey an impression that telephone circuits are inherently subject to failure because they are not. The characteristics and operating requirements for each relay, for instance, are known mathematically and what it can be depended upon to do for a specific period of time. At regular intervals each type of relay is given its proper current adjustment, using measuring instruments designed for that purpose.

The installation of telephone cables and central office equipment of the manual or automatic type required the use of highly trained and skilled labor and the Telephone Company faced the difficulty of obtaining the large number of electricians and mechanics required to hold the schedule and training

them for the special work. As it was, considerable overtime became necessary to maintain a working balance between the arrivals of material and the available labor.

Among the larger items of expenditure, and one involving months of study and calculations in voice transmission, were the additions and changes necessary in the cable trunking plant in order to maintain commercial standards on all local and long distance connections. These studies included the use of and application of loading coils to the former Home Company cable plant amounting to about one thousand coils, and the addition and respacing of many of the coils in the portion of the Pacific Company cable plant. All together about 75,000,000 conductor feet of various gauges of underground telephone cables were ordered and installed to provide new routes and reinforce existing trunk groups required for the consolidated service.

Eliminating Switchboards

Prior to the consolidation practically all of the subscribers having private branch exchanges maintained duplicate switchboards and station apparatus. The problem, therefore, of consolidating this type of equipment offered no particular difficulty, as such consolidations could be and were effected by grouping the trunks formerly serving the separate systems on the particular switchboard to be retained, adding thereto the amount of line and trunk facilities desired by the subscriber and eliminating the duplicate switchboard and stations not required. The net effect was to remove about 345 single position private exchange switchboards from the system. In the case of several of the largest commercial companies, it was necessary to order complete multiple private branch exchange switchboards of the 640-line capacity and all together about 30 sections of such boards were placed in service as fast as the equipment could be engineered and manufactured. It will be interesting to note that the flow of traffic to and from private exchanges was not greatly disturbed from the existing paths by this plan of consolidating; a principle which was kept well in mind and taken advantage of wherever practicable.

Where individual and party stations were duplicated, both stations were left connected until the new directories were delivered, at which time the subscriber was requested to use the telephone of the particular system that he had made application for and the other station was removed as soon as the construction forces could handle the work. Approximately 12,000 duplicate stations have been removed.

Difficulties in Obtaining Operators

A considerable number of operators were required and for a while it looked very much like the consolidation would have to be postponed because of the inability to obtain the needed force. Good service depends to a large extent on capable and efficient operators and you can appreciate the difficulty that confronted the operating department in the selection, employ and training of approximately 500 additional operators required for handling the special transfer switchboard installed in the Olive Office

building, and for the large number of added positions of switchboard in the various manual offices. A large operating school equipment was hurriedly manufactured and installed and training of operators was started about the first of the year 1918. The schedules also provided for the early installation of dials on the subscriber positions in the manual offices for advance training of the regular operating force. Special observation equipment was designed and furnished for practice work in placing test calls and later for supervision in determining and checking the accuracy of dialing the calls placed by the subscribers. By means of automatic recording devices the numbers called for by subscribers or instructors were compared with the numbers actually dialed and in this way the operating force was gradually brought to an efficient basis by the time the construction work was completed.

Readjusting Subscribers

Proceeding under the restrictions that each subscriber having duplicate service should determine for himself whether he retain automatic or manual substation equipment, the Commercial Department carried on a vigorous campaign to obtain each subscriber's wish and to arrange accordingly. The expected result of this canvass had been forecasted and was an essential factor in engineering and construction work.

As a function of the commercial canvass the directory department was confronted with the necessity of recasting the entire directory scheme to fit the particular needs of a unified service. A great amount of thought was given to the determination of the most efficient arrangement of listing and numbering subscribers, and while this seems trivial yet a careless directory arrangement reflects on the quality of the telephone service and robs the public of valuable time. Many number changes were involved and a complete relisting of every subscriber's name and number into one alphabetical list introduced great possibilities of errors. (It is a matter of passing interest that 165,000 copies of the directory were issued and distributed in Los Angeles and to other exchanges for long and short haul toll traffic and that over 441,000 pounds of paper were required in the printing of the consolidation issue.)

Actual Operation

In the present unified plant, local calls are generally divided into four groups and are obtained in the following ways.

Calls from automatic subscribers to automatic subscribers are obtained direct by dialing the number wanted, and as indicated in the directory listings. Calls from automatic subscribers to manual stations are obtained by operating the digit numbered "9" on the dial. This operation carries the connection through to an "A" operator in the adjacent branch office or to the special transfer board in the Olive office of the downtown district where a lamp lights to indicate that a subscriber is calling. An operator requests the number desired and then passes the call by the use of a manual order wire to a com-

pleting trunk operator in the district or particular switchboard unit of the called-for party.

Calls from manual subscribers to manual subscribers are obtained by the removal of the receiver from the switch hook thereby lighting a lamp before an "A" operator, who obtains the number called for and completes the connection by the aid of an order wire in conjunction with the trunk operator serving the called-for station. Calls from manual stations to automatic stations are obtained by the removal of the receiver, which lights a line lamp before an "A" operator, who, upon receiving the number called for notes that it is an automatic station number and proceeds to operate the dial accordingly, thereby completing the connection direct with the called-for party.

	Automatic to Manual	Manual to Automatic	Total Calls
May 31, 1918.....	16,308	31,870	48,178
(1 day before formal announcement)			
June 31, 1918.....	71,883	70,921	142,804
July 19, 1918.....	83,589	76,556	160,145
August 23, 1918.....	95,059	80,285	175,344
September 13, 1918.....	105,602	88,161	193,763

The rapid building up of this service is evident and it is expected that the volume will increase considerably and approximate the amount of traffic for which the present consolidated plant is constructed.

Benefits and Disadvantages

As far as I know no definite statement can be made as to the gains accruing to the subscribers at Los Angeles under the consolidated arrangement, because the most important factors are not capable of reduction to equated savings in dollars.

Some of the major factors resulting in direct benefit are:

1. Value to the subscribers resulting from telephone access to each and every subscriber in the Los Angeles exchange and to all long distance lines centering there.
2. Rental savings resulting from the elimination of a large number of duplicate stations and private exchange switchboards.
3. Elimination of the indirect economic loss due to confusion and community service inefficiency of separate telephone systems.

Some of the factors which tend to offset part of the savings are:

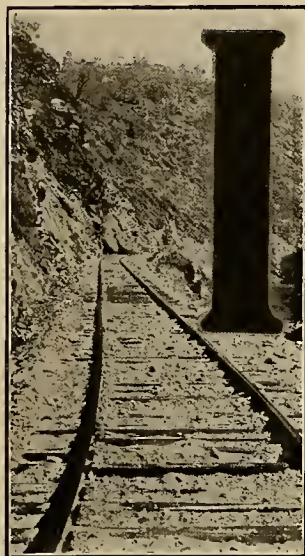
1. Added annual charges on the plant and equipment required to provide means for universal service. There was very little elimination of duplicate plant investment primarily because each plant was designed to care for a definite development and volume of traffic, but because the telephone field is considerably increased to every subscriber, the total volume of traffic in the consolidated plant is substantially increased.

From a careful weighing of these factors it is patent that the consolidated plant offers substantial savings and benefits over the dual systems. The worth of a telephone system to any community lies, not only in its ability to give good service, but that such service shall be universal and available to the maximum possible number of subscribers.

THE HETCH HETCHY RAILROAD

BY RUDOLPH W. VAN NORDEN

(Several of the western power developments on a large scale have necessitated the building of company railroads. Undoubtedly the most extensive of these is the railroad to the Hetch Hetchy water and power project undertaken by San Francisco. Special interest attaches to this particular system owing to the possibility of its later electrification and adaptation to the later requirements of the project. The author was formerly connected with the San Francisco city engineer's office and has recently been over the work.—The Editor.)



Typical country over which the railroad passes. The total length of the road is 68 miles.

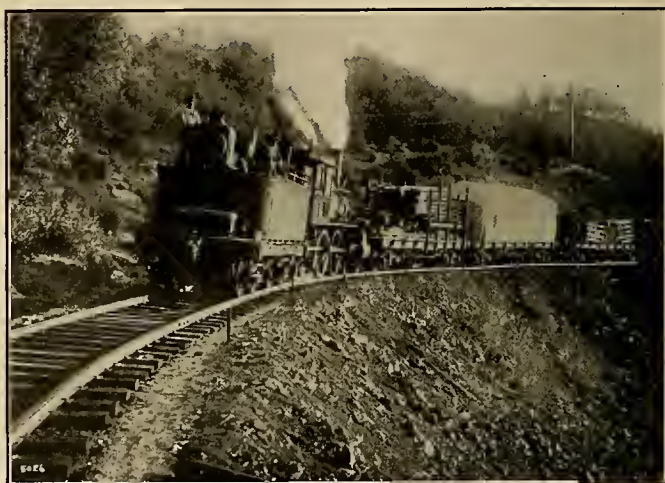
In order to proceed seriously with construction work of the magnitude contemplated on the Hetch Hetchy water and power project of San Francisco, means of rapid and comparatively low cost transportation from existing railroads throughout the entire length of the project was the first and most apparent necessity. The nearest railroad to any point east of the Tuolumne crossing was the line of the Sierra Railway. This railroad connects at Oakdale with the Southern Pacific and runs to Sonora, the county seat of Tuolumne county. It was built many years ago to tap the rich Mother Lode mining section which passes through Tuolumne county. The main line of the road meanders around the hills south of Jamestown, passing along the ridge on the north side of the Tuolumne, not far from the projected conduit crossing of that river. Here is a point, now called Hetch Hetchy Junction, which marks the terminus of the Hetch Hetchy railroad.

Course of Railroad

The Hetch Hetchy railroad, after leaving the junction, takes a course westward, descending the west bank of the Tuolumne to a point one mile west of the inflow of Moccasin creek. Here the crossing is made over a steel overhead truss having a clear span of 220 ft., the approaches being deck plate girders of 40 ft. span. It is designed for Cooper's standard specification E-35 loading.

After leaving the river, the grade ascends the east side of Moccasin creek, passing above the power house site, circling around to the south of the projected forebay reservoir and thence above the Priest Portal camp, thence continuing through Big Oak Flat to Groveland, where are located the headquarters, not only of the railroad, but of the entire work. A negative grade from Groveland carries the railroad past the Big Creek Shaft, thence resuming the upgrade, and the canyon of the Tuolumne is skirted into the South Fork, which is crossed on a ballasted deck timber trestle to the South Fork Camp at an elevation of 800 ft. above the South Fork portals. The climb is again resumed when the slope of the

Tuolumne canyon is reached and the ridge between the main and Middle Forks is followed to Hog Ranch. Soon after passing this point, the summit, or highest point in the grade, is attained at Poopenant Pass, El. 5064, thence the descent is made, a distance of $7\frac{1}{2}$ miles, to the Damsite Camp at the Hetch Hetchy valley. Here the line runs through the camp where there are several switch tracks, a freight yard and a cattle corral; passes the warehouse, thence around the knoll at the south end of the damsite, but on a grade 40 ft., above the pro-



THE ROAD IN USE

The equipment of the road consists of two Heisler and one Shay geared locomotives, using oil fuel, but if the road is to be used later for transportation of lumber and saw logs it will probably be equipped for electric operation.

posed crest of the dam, thence circling back to the main line. The last section from the damsite returning to the main line has not been completed, otherwise the railroad construction is finished except for the stone ballast, the entire line being laid on the sub-grade.

Material and Equipment

The total length of the railroad is 68 miles. Throughout, except for a few short stretches, the grade is laid to 4 per cent, compensated. The maximum curvature is 30° and there are many curves from 20° to 28° . Standard ties of pine were supplied largely from the city's own mills, or those near the line. The rails are A. S. C. E. standard 60 lb. per yard. The equipment consists of two Heisler and one Shay geared locomotives, using oil fuel. These will be superseded as soon as war conditions will permit with direct-connected Mikado type locomotives. Local passenger traffic is by means of motor trucks fitted with flanged wheels with which a regular daily schedule is maintained. The road was built by contract, and much heavy grading was necessary,

especially in the upper end where, along steep side-slopes, the solid granite was benched in many places for long stretches. The last 9 miles from Hog Ranch is graded to a width of 22 ft. This is for the purpose of providing a highway into the Hetch Hetchy after all construction work shall have been completed. The main highway to Yosemite passes through the South Fork camp and there is a branch which goes to Hog Ranch and thence over to join the Tioga highway. It is proposed to continue this road from Hog Ranch into Hetch Hetchy with a wide concrete boulevard.

Of Local Use Only

The impression that has at times become current, that the Hetch Hetchy railroad would at some future time become a part of a transcontinental railway, or even a trans-Sierra railway, is erroneous. The heavy grades and curvature will not permit of any rapid traffic or use as such a railway would be



THE BRIDGE OVER THE TUOLUMNE

The grade throughout except for a few short stretches is laid to 4 per cent. The maximum curvature is 30°, there being many curves from 20° to 28°.

expected to perform. It can be equipped for electric operation and later used for local business, principally the transportation of lumber and saw logs, which promises a lucrative return. The construction cost of the Hetch Hetchy railroad was \$29,400 per mile, or to be exact, a total amount paid the contractor of \$2,000,000. More than 1,000,000 cu. yd. of excavation, mostly rock, was necessary and 500,000 B-M ft. of lumber was used in trestles.

THROUGH THE PACIFIC NORTHWEST BY ELECTRIC RAILWAY

BY D. H. COLCORD

An ideal way to see the country is through the open window of a strictly modern electric railway car. This is especially true in traveling in America's great wonderland of the West—the State of Washington. Undoubtedly there is no electric system in the world that covers as diversified ground as the Pacific Northwest Traction Company, which extends from Bellingham, Washington, to Mt. Vernon, a distance of twenty-eight miles. Bellingham is located on an immense arm of the sea, Puget Sound, which



SKIRTING CHUCKANUT BAY

Typical of the mountain scenery through which the road passes

extends through the State of Washington for 250 miles. The present system is one of particular beauty, passing through a region rich in industry and agriculture and with great undeveloped water resources.

A substation is located at Clayton Bay, from which the car passes over several miles of trestles. The entire unusual trip through mountain scenery and over country formerly traversed only by trails is made under electric power, the cars being furnished with Westinghouse motors. The line is soon to be extended from Bellingham to Seattle.

The use of the electric car not merely as a means of getting between two points, but over scenic routes in the mountain districts as well, is an innovation to which the West is particularly adapted. The Pacific Northwest Traction Company's line between Bellingham and Mt. Vernon serves the very useful purpose of providing transportation between the two points, but it is besides a trip to be taken for its scenic interest alone.



FUEL OIL SAVING IN RAILWAY ELECTRIFICATION

(The U. S. Fuel Administration during its regime in California recommended the electrification of certain of the mountain sections of the railways with the object of conserving fuel oil. Although this was proposed as a war measure, the data is now at hand for peace time purposes and serves as an indication of the possibilities of electrification from a financial as well as a technical standpoint. Extracts from Mr. Dietrich's report were given in an early issue, but the accompanying charts are of special interest.—The Editor.)

The basis for the report and its present application may be judged from the following introductory statement:

Present conditions of traffic and for the most part present prices are considered. It must be remembered in this connection, however, that the



PROPOSED RAILWAY ELECTRIFICATION FOR CALIFORNIA

An expenditure of \$23,000,000 on the proposed electrifications will result in an annual saving of over 3,000,000 barrels of oil and will return a net profit of 9 per cent on the investment, at the present prices of fuel oil. The annual electric power requirements will be in the neighborhood of 267,000,000 kw-hr. and the maximum demand will be 121,600 kilowatts. The districts considered for electrification are (1) Part of the Sacramento Division of the Southern Pacific Company, from Roseville, California, to Sparks, Nevada, (2) Main line of the Shasta Division of the Southern Pacific Company, from Gerber, California, to Ashland, Oregon, and (3) Part of the San Joaquin Division of the Southern Pacific Company, from Bakersfield to Saugus, California. The Atchison, Topeka and Santa Fe Railway uses the Southern Pacific Company tracks from Bakersfield to Mojave.

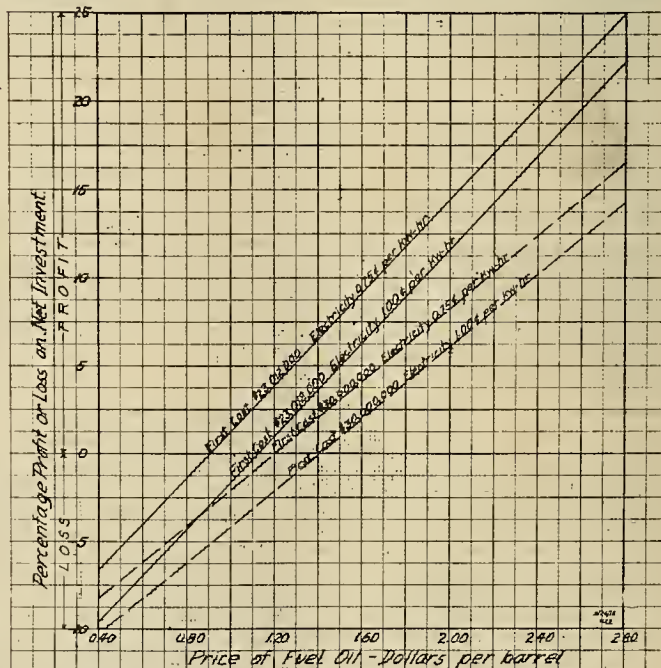
annual traffic is constantly on the increase, and that the greater the traffic, the more favorable will be the case for electrification. Likewise, the unit costs of electrification under present conditions are probably much higher than they will be after the war, while at the same time it is hardly likely, in view of the impending shortage of fuel oil, that the cost of fuel oil will ever be less than it is at the present time.

The railroads consume more coal and fuel oil than any other single industry. Over 20% of the annual production of coal and fuel oil in the United States is consumed by the railroads, and half of this

amount is wasted by the inherent inefficiencies of steam locomotion. Of the California production of fuel oil in 1917, 31.2% was consumed by the western railroads. The West is facing the necessity of providing for rapidly increasing fuel demands with a declining production of oil from California fields. Some of this demand will be met by increased hydro-electric development, some will be met by the utilization of low grade bituminous fuels and the opening up of new coal fields, but this does not lessen the importance of conserving fuel in every way possible, and one of the first steps in this conservation is to eliminate as much as is commercially feasible the wasteful use of fuel by the railroads.

Thus it can be seen that railway electrification will become more and more a necessity, both from the standpoint of saving in operating costs, and from the standpoint of the conservation of fuel oil.

According to the results obtained in this report a net expenditure of \$23,000,000 on the proposed electrifications will result in an annual saving of over 3,000,000 barrels of oil, and will return a net profit of 9% on the investment, at the present prices for fuel oil. The annual electric power requirements will be in the neighborhood of 267,000,000 kw-hr. and the maximum demand will be 121,600 kilowatts.



PROFITS POSSIBLE FROM RAILWAY ELECTRIFICATION

The effect of fuel oil prices, the cost of electricity and the increase in first cost on the percentage of profit obtainable by the proposed electrifications in California is here graphically illustrated. Thus it will be seen from the chart that with oil at \$1.60 a barrel, with an initial cost of \$30,000,000 and electricity at 1¢ per kw-hr. approximately 2 per cent profit on the investment would be obtained. With less initial cost, as much as 9 per cent is possible. With oil as low as \$0.90, no profit would be obtained and the project would be out of the question.

Co-operative Campaign Problems —

BY W. F. BRAINERD

(The representatives of the California Electrical Cooperative Campaign in their traveling about the country have an opportunity to note clever methods of merchandising as practiced by the electrical contractor-dealers of their district. Brief descriptions of such items will appear from time to time in the columns of the Journal of Electricity. The following is from the representative of the campaign in the northern district.—The Editor.)

FOLLOWING UP THE WIRING JOBS

A bundle of assorted folders of the various electrical household helps is sent out to every housewiring job by the Garden City Electric Company of San Jose.

These folders are included in the requisitions for material for each job and are treated as part of the necessary material for the job. Tied in a bundle they are fastened to a fixture, so that they will be found by the incoming tenant in new houses. In houses already occupied they are placed in the hands of the lady of the house.

Manager Henry Doerr says he can trace many sales to this method of advertising.

SECURING A STORE MANAGER

Securing competent store managers has been one of the problems the electrical dealer has had to meet.

It has been found that most of the experienced competent men have had their training along a practical line, rather than as merchants. While men can be found who can sell a big wiring job, it is hard to find a man who can handle the store in a way to sell Mrs. Jones her electric iron.

One live dealer in Oakland has worked this out to his own satisfaction. The former manager of a department in a stationery store was secured. His merchandising experience has resulted in an attractive arrangement of the interior of the store and properly dressed windows, frequently changed. He

has also been able to institute many good selling plans. The advertising is also handled by him; as there are a number of experienced electrical men in the store organization, he can always get help on electrical jobs.

The owner of the store is greatly pleased with this arrangement, as he says that it results in a better looking store, more attractive windows and greater sales.

STANDARDIZING ADVERTISING

A very effective way of impressing his business on the mind of the public and then tying it to his store has been originated by H. G. Chaffee of Chaffee's Electric Shop, Visalia.

In prominent locations on all of the main highways leading into Visalia Mr. Chaffee has erected large signboards, cut out in the shape of an electric lamp. On the board in addition to the name and address, is the statement that he handles "wiring fixtures, etc."

The unusual shape of the board, besides attracting attention, impresses the fact that it is electrical goods being advertised. To tie his store more closely to the advertising, one of the signboards is mounted on the front of the store.

Mr. Chaffee says he can definitely trace an increase in his business to this unique form of advertising.

ASSISTING UNIVERSITY EXTENSION

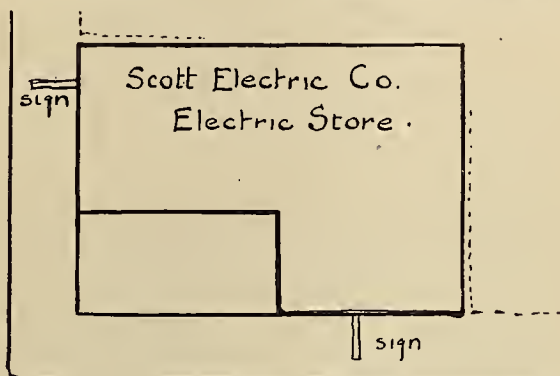
A splendid new field of usefulness has developed in the educational work of the Campaign. The Extension Division of the University of California is revising its course for electrical workers so as to meet the needs of technical study in all branches of the industry throughout California, and a special committee consisting of R. M. Alvord of the Advisory Committee and Robert Sibley, editor of the Journal of Electricity, has been appointed to co-operate in every way possible in forwarding this helpful work.

A striking sign which has the same advantage as a trade mark. It is always the same—and is to be seen on road corners and along the main highways over the countryside. The same sign is used over the door of the Electric Shop and means that the end of the pilgrimage is found—and that this is the store whose advertising was seen several miles out of town.



Western Ideas

THE CORNER STORE has its advantages, of course, but the "ell" store which encircles the corner with an entrance on two streets may prove equally effective in location. This is certainly true of the Scott Electric Company of Portland, Ore., of which a view is here shown. The business has the advan-



The store is built on an ell, thus providing an entrance and store front on both streets

tage of the traffic on both streets during the day time with perhaps even greater appeal than has the corner. Windows are always well arranged and of a nature to be remembered, so that the passer-by is conscious of passing the same store twice in rounding the corner. This leaves time to recall that lamps are needed or that the electric iron needs



The signs are flashed on alternately at night, which produces a most striking effect when viewed from the opposite corner

repairing, and by the time the second door is reached, the prospect who has made up his mind to remember the errand the next store he passes is ready to become a customer.

At night an effective electric sign doubles the drawing power of the shop. Duplicate signs are erected over each entrance and are flashed on alternately, one sign dying out as the other goes on. From the street the effect is most striking.

THE DEMONSTRATION CAR has long been a recognized factor in University extension work. The same medium for "spreading the gospel" has been adopted by a California central station which sent a trolley car through the rural districts fully equipped with the latest electrical labor saving devices for the home, giving demonstrations at vil-

lages along the road. A large volume of sales was traced directly to this source.

Another productive sales effort was the demonstration of electrical appliances before rural schools. The demonstrator made appointments to lecture to the pupils with the understanding that he would not mention buying or selling.

Not the least important result of this educational work was the good will it built up for the company.

THE PROOF OF THE PUDDING is in the eating—and the best advertisement of an electric range is the successful demonstration of its use. The luncheon, the account of which is here given, was not merely a delightful occasion therefore but served as very good advertising.

Forty-five members of the sales and executive staff of the Northwestern Electric Equipment Company, of St. Paul, sat down to an electrically cooked luncheon at the St. Paul Hotel recently and partook of a meal which was prepared on a Model "D" Hotpoint range, manufactured by the Edison Electric Appliance Company. This affair took place during the annual conference of the Northwestern Electric Equipment Company. It was unique in that the entire meal was prepared at a total cost for current of 31.128 cents, or .00691 cents per person, which is a trifle less than seven mills.

Some interesting figures were brought out as the result of this luncheon which we believe are interesting enough to tell the reader. The total wattage was 7782, or 172.9 watts per person, the extremely low consumption being accounted for by the successful utilization of stored oven heat. The current consumption of the three surface burners was 2682 watts. Here are some interesting figures on the wattage consumption of the various items which comprised the menu:

10 cans soup.....	469 watts
18 lbs. roast beef.....	2325 "
1½ pecks potatoes }	1188 "
2 cans peas }	
5 cans corn	300 "
6 loaves bread	1000 "
5 dozen rolls	700 "
50 portions pudding.....	1275 "
70 cups coffee.....	525 "

The luncheon was prepared under the auspices of Mr. A. H. Jaeger, the Northwestern Sales Representative of the Edison Electric Appliance Company, Hotpoint Division, and was assisted by Miss Bernice Bell, Domestic Science Expert of the Northern States Power Company, who was responsible for the preparation of the viands. The luncheon was unique in more ways than one in that the menu was prepared in terms the average restaurant patron would scarcely understand, the items being as follows:

Switches	Insulators
Transformer Oil	Braces
"Heart of the Range" with HP (Hotpoint) Sauce	
Chafing Dish Service	
Bushings	
Standard Oven	Ovenettes
Insulation	
Day Load	High Voltage
Percolation	Binders and Fittings
Hotpoint Ideals	

A SAVING OF TIME as well as string is suggested by an ingenious method of tying a bag recently illustrated in the Popular Science Monthly. The old method required enough string to encircle the parcel two or three times before it was held securely and that needed from 20 to 36 inches of string for a moderately small package.

The new method is as follows: Close the bag according to the old method. In the first fold place the string and fold as often as is necessary after that to adequately close the bag. The corners are then turned toward the center and flattened. This brings the two ends of the string together to be tied. The finished package is neat and firmly tied, presenting a pleasing appearance, and what is unusual, only four or five inches of the string is required to make the tie.



Method of fastening package

THE DANGER OF MARKING DOWN goods is that you discredit the legitimate price you originally asked for them. A woman was heard, not long ago, to read an advertisement of \$5 hats for \$2.98, and to express wonder that a store could sell them at such a low figure and still make a profit, for she did not believe the store proposed to lose money.

"Think what a profit I would have paid them at \$5.00," she said.

That is one side of the story, says a bulletin from the National Vigilance Committee of the Associated Advertising Clubs of the World.

The other side is that a great many other women refuse to believe that the article advertised was ever worth the higher figure named—or \$5, as in this case.

"Usual value," or "value" or "worth" are destructive advertising expressions, the bulletin from the committee declares. They dull the appeal of advertising. When a store does have a real sale to move off odds and ends, a great many readers of its advertisement are in the same attitude as the men who declined to come when the little boy in the old story called "Wolf, wolf."

It is being proved, the committee says, that business of a more permanent character can be built without such statements. If there has been a special purchase, a store can get a crowd by announcing that a fortunate find has been made by its buyers. It is needless to "compare prices." Business men, says the bulletin from the committee, are learning that truth-in-advertising has an economic value, and that in the long run, it pays to understate rather than over-state in an advertisement. The under-stated advertisement may bring fewer people, at times, but it will sell more goods, for when the customer is surprised to see such goods at such a price, sales

are more readily made. There is less of a tendency to "shop around."

"No advertiser can afford to take the stand that his advertising policy is correct merely because his advertisements sell goods," says Merle Sidener, chairman of the National Vigilance Committee of the advertising clubs. "There is more than this to success. Advertisements and store policies must work together in the making of customers, not the mere sale of goods. Many a store which has had wonderful 'special sales' has in the end been forced to change its policy or go out of business, when these sales have been based upon deception."

The bulletin points to two stores—one a clothing store in Indiana, the other a millinery store in Ohio—which can draw enormous crowds to special sales, using small advertising space, simply because the owners have not advertised bargains day after day, but have advertised bargains only when they actually had stock reduction sales.

In another instance, it is the custom of a department store, when selling "seconds," to mention the fact that the goods are especially priced because of small imperfections, and it suggests to customers that they ask the salespeople to point out the defects in each article. A similar policy has been followed by a clothing store in one city, with equal success.

It pays to be truthful—it brings better profits, declares the vigilance committee, and this opinion is based upon the actual experience of many leading stores.

NEW IDEAS are apt to get lost if not jotted down. Of course the majority of business men use some form of "tickler," the most common being the small box for 3 inch by 5 inch cards with 1 to 31 and January to December guide cards. In addition a few guide cards act as special reminders, the most important being the one marked "New Ideas." One business man wrote of his system:

"I believe most of us frequently have 'pop into our heads' ideas that are really very valuable, but which we can not use just at the moment. Often these ideas are lost before they can be used. I make it a rule to jot down any new idea on a 3 inch by 5 inch card (I generally have a small supply in my pocket) whenever the idea comes into my head. Many of my ideas come to me while on the train or street car, as at that time my mind seems to be unusually active. When I get into the office I drop these cards in front of the 'New Ideas' guide cards, except those bearing suggestions I want to put into action at some definite date in the near future, which I drop in the tickler, so that they will come up on that date.

"On the 10th, 20th and 30th of each month a card comes up in the tickler marked 'Review New Ideas.' At this time I take out all the 'New Idea' cards and look them over. If I think I will want to put any of the suggestions into action in the near future, I drop the card into the tickler, so that it will come up at the proper time. The other cards I drop back to be reviewed again later, or throw them away, as the case warrants."

OREGON CONTRACTOR'S LICENSE LAW

(The use of electricity is becoming so common in country districts where there is often no provision for the inspection of installations, that it becomes necessary to standardize practice in electrical contracting. Laws are being proposed in the legislatures of several of the western states aiming at this end through licensing of those permitted to make installations. Here is the text of the proposed Oregon law.—The Editor.)

Section 1. From and after the taking effect of this act all installations in the State of Oregon of wires or equipment to convey electric current, or installation of electric apparatus to be operated by such current, shall be made in accordance with the laws of the State of Oregon, or city ordinances or building codes relating to such work of the city or town in which such work may be done and in the absence of state law, and in the cities and towns of ordinances or building codes, prescribing the manner of installation of wires and electrical equipment to convey electric current and of electric apparatus to be operated by such current, such work shall be done in substantial accord with the rules laid down for such work by the United States Bureau of Standards relating to such work so far as the same covers both fire and personal accident hazards and as the same shall be compiled and published as hereinafter provided.

Section 2. All persons, firms or corporations hereafter engaging in conducting or carrying on the business of installing wires or equipment in the State of Oregon to convey electric current or installing apparatus to be operated by such current, shall on or before the 1st day of July of each year file with the Secretary of State an application in writing for and obtain a license so to do; which application shall state the name and address of the applicant, and in case of firms the names of the individuals composing the firm, and in case of corporations the names of the managing officials thereof, and shall state the location of the place of business of the applicants and the name under which the business is to be conducted. No license hereunder shall be issued until the applicant therefor has paid to the Secretary of State for the benefit of the State of Oregon an annual license fee of Fifteen Dollars (\$15.00) and shall have executed a bond in the penal sum of Five Hundred Dollars (\$500.00) running to the State of Oregon with good and sufficient surety to be approved by and which bond shall be filed with the Secretary of State, to be conditioned that in the installation of wires or equipment in the State of Oregon to convey electrical current or apparatus to be operated by such current, the principal in such bond will make such installations according to the requirements of the laws of the State of Oregon, or city ordinances and building codes of the cities or towns in which such electrical installations are made relating to and in effect at the time of entering into the contract for such work, and that in the absence of state law, city ordinance or building code covering such work, the principal will make such installation substantially in accord with the rules laid down by the United States Bureau of Standards, to be furnished as hereinafter provided, relating to such work so far as the same covers both fire and personal hazards, and conditioned further that the principal will pay all labor and material claims upon such work and all damages sustained by any person, firm or corporation arising from failure of the principal to make such installations in the manner aforesaid.

Section 3. Any person, firm or corporation making application therefor and affidavit to the Secretary of State that such person, firm or corporation has been damaged by the failure of the principal in any such bond to comply with the requirements of this act or the provisions of the bond given, shall be furnished with a certified copy of the bond of the person, firm or corporation named in such affidavit, and shall have the right to bring an action in the name of the State of Oregon for his or their use and benefit against such prin-

cipal and surety to recover for any labor or material furnished the principal in such bond and unpaid, and for his or their damages arising out of the failure of the principal named in such bond to comply with the requirements of this act, and to prosecute the same to final judgment and execution; provided, that the surety's total liability on such bond shall not exceed the sum of Five Hundred Dollars (\$500.00) and the right to commence action against such surety shall not exist for a longer period than Ninety (90) days from the substantial completion of any contract.

Section 4. All licenses shall bear the date of issue and shall expire on the 1st day of July next following the date of issue, provided that all licenses issued prior to the first day of July, 1919, shall expire on the 1st day of July, 1920.

Section 5. Every person, firm or corporation licensed under the provisions of this act shall be entitled upon the expiration of his license, or the renewal thereof, by the payment of a fee of Fifteen Dollars (\$15.00) on or before the date of his expiration of license or any renewal thereof to have his license renewed for the ensuing year ending July 1st, so long as the bond originally given in compliance with the provisions of this act shall remain in force. The cancellation of or revocation of or the withdrawal of the surety from any bond filed in accordance with the provisions of this act shall ipso facto work a suspension of the license of the principal on such bond, until such time as such principal shall furnish a new bond to be approved by the Secretary of State.

Section 6. It shall be the duty of the Secretary of State to obtain and keep on file in his office a copy of the rules of the United States Bureau of Standards relating to the installation of wires and equipment to convey electric current, and of electrical apparatus to be operated by such current so far as the same covers both fire and personal accident hazards as promulgated and issued by such bureau on the first day of July of each year, and to have printed and delivered to all persons licensed under the provisions of this act, and upon request to the general public, copies of such rules on file in the office of the Secretary of State on the first day of July of each year shall be deemed the rules laid down by said Bureau of Standards for the following fiscal year, and printed copies of such rules, certified to as such by the Secretary of State, upon the date named in such certified copy.

Section 7. The licensing provisions of this act shall not apply to individuals, firms or corporations or to municipalities authorized to engage in the business of making or selling electricity in connection with the construction or maintenance of lines or wires for the transmission of electricity from the source of supply to the service switch, fuses or circuit breakers on premises or property to be supplied, nor to the work of individuals, firms, corporations or municipalities in installing, maintaining or repairing on the premises of customers' service connections and meters and other apparatus or appliances used in the measurement or the consumption of electricity by customers, nor to work in connection with the lighting of streets, alleys, ways or public areas or squares, nor to the work of persons, firms or corporations in installing and maintaining wires, apparatus and appliances used in their business on their own premises, nor to individuals, firms or corporations installing, maintaining or repairing apparatus or wires for making or distributing electricity upon the premises or property owned by them nor to persons en-

The maximum demand shall include the total connected wattage of lamps; empty sockets to be taken as 25 watts each. Heating devices not to be taken as part of the maximum demand except where maximum demand is measured by demand meters (at the option of the Light Department), in which case the maximum demand, as measured by the meters, will be taken. The demand used for computing the rate shall be figured to the nearest 100 watts only; any demand less than 200 watts shall be considered as having a capacity of 200 watts. Provided, that the minimum charge for current under this schedule shall be \$1.00 per month.

GROUND TELEGRAPHY IN THE WORLD WAR

BY LIEUT. WILLIS L. WINTER

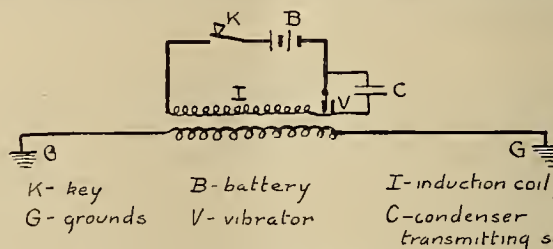
(Many of the developments of the war will find peace time application and add improvements in methods and apparatus which would have been long in coming to flower without the urgent necessity of the great conflict. The young men who served along specialized lines in France are now coming home to spread the knowledge they have acquired and fit it into home needs. One of these developments which may prove of considerable value is here described by a former lieutenant in the Signal Corps who saw active service in France and is now with the Westinghouse Electric & Manufacturing Company.—The Editor.)

When war is mentioned, the mental picture which naturally appears contains ruin and destruction. Seldom does one think of the workshops back of the "long thin line" where scientists are crowding the inventions and developments of decades of peace into the few short years of war. Some of these are sensational as, for instance, the aeroplane, the submarine or the wireless telephone between aeroplanes. Others, less important and less known generally, should be considered for application to the pursuits of peace.

Difficulties of Early Methods of Communication

When war broke out in Europe the transmission of intelligence was accomplished by one of the following means: telephone, telegraph, runner, visual

click could not be picked up ten feet from the instrument. It was copied and improved in our own Buzzerphone. But these did not fill the greatest need. Some means of communication was required which did not depend on metallic connection between stations and which had to be hardy enough to withstand shock and abuse. The wireless telegraph was



Diagrammatic explanation of the layout in the transmitting of messages over the ground telegraph

good three or four miles back of the line but it was too frail and too easily put out of adjustment farther forward. As a result of this necessity the ground telegraph was developed.

Principles of Ground Telegraphy

Everyone is familiar with the phenomenon of the ground return circuit where only one side of the circuit is metallic, the other side being the ground. The electricity in returning through the earth distributes itself inversely as the resistance of the path that it takes. Just as though the earth between the two grounds were divided into small conductors and a portion of the current flowed in each one. Of course the direct line between the two grounds would have the lowest resistance and therefore would have the greatest current flow. As the paths become longer and longer the current flowing in them becomes less and less until finally it becomes exceedingly small.

Now, if we install another grounded circuit, with a telephone receiver in it, in the affected area, part of the current flowing in the earth will be shunted through the circuit and any change of current in the primary circuit will make itself apparent in the receiver in the secondary circuit. When an alternating current is caused to flow in the primary or sending circuit the effect of the current flowing in the secondary circuit may be heard in the receiver for the length of time that the current is on. If the current is on for a short time we have a dot; if for a long time, a dash, the basis of the telegraphic means of communication.

In French practice (the American adaptation had not yet come into general use when the armistice was signed) the sending set is a heavy vibrator, designed for carrying a heavy current, in series with

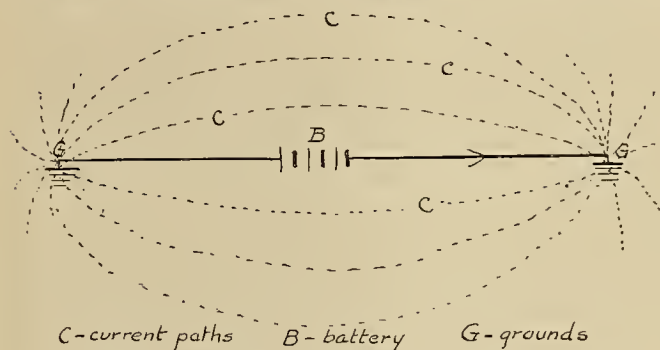


Diagram illustrating current lines through the earth

signals or wireless telegraph. Difficulties were immediately encountered, chief of which were these: (1) Telephone lines were constantly being cut by artillery fire just at the time when the communication was most needed, (2) the enemy was "picking up" our messages by induction and amplification and hence knew exactly what was happening within our lines, (3) the wireless antennae were too easily seen and the station too easily destroyed as a result, (4) the operation of the wireless set was too skilled—when the regular operator was put out of action there was no one to take his place, (5) too much time was consumed in getting messages back to headquarters (the need for quick delivery of a barrage call, for example, is apparent).

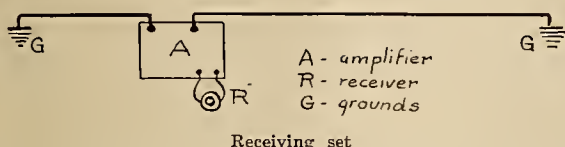
Developments of the War

Remedies for these troubles were sought and quickly found. Fireworks were introduced. Thus when a certain rocket was fired in the trenches it meant to the artillery observer that a barrage was wanted instantly in a certain sector. This system was developed to the point where the shells were screaming overhead within thirty seconds after the rocket was fired. A non-inductive telegraph was developed by the British called the Fullerphone, whose

a ten volt storage battery, a key and one side of an induction coil. The other side of the induction coil is run out to the grounds.

These grounds are usually made up of five or six ground rods each stuck into the ground about six inches. The distance between grounds varies, depending to a great extent on the nature and condition of the soil. A total resistance of fifty ohms in the entire circuit was found to be most satisfactory, which corresponds to a length of base from fifty to one hundred and fifty yards. The frequency of the vibrator is adjustable between 250 and 800 vibrations per second by means of weights being attached to the vibrator itself.

The receiving circuit is longer than the sending circuit when used alone, varying from 100 to 200



yards. Because an ordinary telephone receiver is not sensitive enough an amplifier is always connected in the circuit. The French use a three step amplifier but the Americans have developed a two step amplifier with the same power of amplification.

Strangely enough, up to the time that the Americans entered the war the French had used only the one way set. Infantry battalions were equipped with sets for transmitting messages to the regiment but they had no means of knowing whether their message had been received or not. The reason, they claimed, was that the amplifier was too delicate an instrument to use forward of the regimental headquarters. The Americans, however, installed sending and receiving sets at practically all battalion and regimental headquarters and in many cases the apparatus more than justified its development.

Conditions of Operation

The range of the ground-telegraph is dependent largely on the condition of the soil and the relative positions of the bases. The soil should not be wet enough to short circuit the current through it nor should it be so dry as to cause the resistance of the earth to cut down the current to any great extent. The common range over which the system was used was from two to three kilometers (one to two miles) but there is no reason why the apparatus cannot be developed further. The best relative positions of the bases was found to be opposite and parallel, that is, the line connecting the centers of both bases should be perpendicular to both. If that is impossible the condition that both bases be chords of the same circle should be fulfilled.

Applications in Civil Life

Although the ground telegraph is a development of warfare there is no doubt in my mind but that it will be applied in civil life. It can be installed as an alternate to the telephone in places where wire communication is liable to destruction by storm. Again, a small hand set may be developed which can be car-

ried by engineering parties through which they can be kept in constant touch with their headquarters. Necessity in other lines may also find a solution in the ground telegraph.

PROPOSED IRRIGATION DISTRICT POWER PROJECT

The proposed Don Pedro dam, to be installed four miles above La Grange, where a reservoir and power plant are also planned by which it is hoped eventually to water 240,000 acres of irrigable land in the Modesto and Turlock irrigation districts, is briefly outlined in the report of the consulting engineer.

The dam, power plant and reservoir will cost in the neighborhood of \$3,489,000. The dam will be 279 feet high, not including 10 feet of masonry to be put in the bottom of the rock bed of the Tuolumne river to act as a cut-off wall. The base will be 177 feet. The dam will be of the arch type, and the masonry will taper from a 16-foot top. On this top there will be a roadway 1000 feet long. The dam complete will cost \$2,880,000.

The project includes the construction of an eight-mile railroad to haul supplies, labor and materials to the scene of the work. This railway will connect with the Sierra road at Rosasco, 39 miles above Oakdale. It will cost \$93,000.

The power plant, which is to be located below the dam, is estimated at \$609,000 complete. It will have a capacity of 16,000 horsepower and 12,000 kilowatts. A storage capacity of 250,000 acre feet is planned for the reservoir, which will be available during the fall months when the canals are dry. Appropriations have already been secured by the two districts to be served by priorities of location dating back several years. The dam and reservoir will be built first, and then the power plant.

River records kept for 23 years near the present La Grange dam show that during all that time there were but four years in which the water supply was less than is needed to irrigate the proposed 240,000 acres to be watered under the project proposed. In all this time there was but one year when the shortage would have been serious.

At present 160,000 acres are being irrigated in the two districts. The dam, reservoir and power plant will equip the area to be served with facilities for assuring water all the year round for the entire 240,000 acres, or an additional 80,000 acres over what are now being served with water. Cheap power for lighting, pumping, farm work and irrigation purposes will also be served the district.

The average discharge of the Tuolumne river is 2,096,000 acre feet, and the average silt deposit at the above ratio will be 314 acre feet per year. According to the report it would take 40 years to fill up the bottom of the river channel not considered in the capacity of 250,000 acre feet assumed as the net capacity.

DIFFICULTIES IN ELECTRIC HOUSE HEATING

BY JOSEPH F. MERRILL

(The day when a house—or a city—may be built without a chimney is a pleasant picture to look forward to. But with all our interest in the extension of the use of electricity it is necessary to look practical considerations squarely in the face. It is obvious from the figures given below that electric house-heating is not a practicable load for the average power company—nor is it likely to become so without radical advances in the economical generation of electricity. The author is director of the schools of Mining and Engineering of the University of Utah.—The Editor.)

Legitimate Uses of Electricity for Heating

There are, of course, well known and very successful applications of electric heat to household appliances. These will not be discussed here, except to distinguish them from the problem here to be discussed. The electric range, flatiron, and similar appliances, are illustrations. Here the heating element is placed directly at the point where the heat is desired, and the entire heat output of the element is efficiently used in contradistinction to use of a stove for similar work, in which the larger part of the heat is wasted in firing up, and in escaping to the room and the chimney. Thus, notwithstanding the greater cost of a thermally equivalent amount of electricity as compared with coal, the increased efficiency of the former outweighs other considerations, and reduces the cost of the electric use to the point comparable with coal costs.

For illustration, a coal range must be fired long before the cooking time, so as to bring the surface or the oven to a temperature ready for cooking, and the coal continues to burn after the food is cooked. It has been estimated that not more than 1% of the heat value of the coal is actually applied to cooking in the ordinary range. On the other hand, the electric range becomes hot almost immediately, and operates at close to 100% efficiency in delivering the heat to the cooking utensils. Practically none of the heat escapes to the kitchen.

It is therefore important in considering the feasibility of electric air heating not to confuse the problem with electric cooking and similar uses.

The Central Heating Plant

For convenience in use and attractiveness to the consumer, electric air heating can be best compared with central district steam heating, which will yield the consumer the same freedom from personal care and responsibility. It may be safely affirmed that not one person in a hundred would pay any more for electric air heating than for central district steam heating. The latter, furthermore, affords actual basis of comparison because it is in successful use and operation both from a thermal or heat giving standpoint, and from an economic or financial standpoint in many cities.

Costs of a Central Steam Heating

Records of operation of a central district steam heating plant, heating several buildings in the business district of Salt Lake City, yield the following results:

Space heated (cubic feet).....	8,187,000	
Capacity of plant, maximum demand.....	600 Boiler h.p.	
Steam generated (per year).....	60,000,000 lbs.	
Steam sold (per year).....	48,310,000 lbs.	
Overall thermal efficiency (Boiler Furnace 53%, Transmission 80%).....	42.4 %	
Coal Consumption (quantity).....	4,744 tons	
Coal Consumption (Price, \$2.97 per ton).....	\$14,069	
Steam generated per 1000 cu. ft. space heated	7,330 lbs.	
B.t.u.'s delivered per 1000 cu. ft. space heated		
(1000 B.t.u.'s per lb. steam).....	5,900,820 B.t.u.'s	
Coal required in boiler for 1000 cu. ft. space heated.....	1,160 lbs.	
Operating cost (12 mos. ending Oct. 31, 1918)	\$29,525	
Operating cost per 1000 cu. ft. space heated		\$3.60
(per year).....		.61
Operating cost per 1000 lbs. steam sold.....		
Investment (physical valuation).....	\$140,000.00	
Fixed charges:		
Interest 7%.....		
Depreciation 3%.....		
Taxes and Insurance 2% — 12%.....	16,800.00	
Fixed charges per 1000 cu. ft. space heated.....		\$2.05
Fixed charges per 1000 lbs. steam sold.....		.35
Total costs:		
Per 1000 lbs. steam.....		\$0.96
Per 1000 cu. ft. space heated.....		5.65

Costs of Electric Heating

Let us compare these costs with the cost of delivering from the same plant an equivalent amount of electric heat. As a preliminary, some fixed notions of relative values must be obtained. A kilowatt hour of electricity yields 3412 B.t.u.'s. On the other hand, as compared with this, one boiler-horsepower, by definition, yields 33,524 B.t.u. per hour. Consequently, one boiler-horsepower yields very approximately the same heat value as 10 kilowatts of electric capacity yields per hour, and this ratio is a ready reference rule of thumb frequently used by steam engineers. This, of course, is the thermal equivalence of the respective units, and has no reference to equivalence or disparity in mechanical energy.

From this relation it becomes apparent that to deliver the 600 boiler h.p. of heat by electricity will require a 6,000 kilowatt generating plant, whether steam or water power. Using our figures previously developed, \$75.00 per kw., 6,000 kilowatts of steam capacity in Salt Lake City would increase the capital investment to \$450,000 for plant capacity alone, exclusive of the distribution system, included in the capital investment of \$150,000 for district steam plant. The capital investment for a hydro-electric plant would be from two to four times this amount, exclusive of transmission and distribution.

To find the cost of coal required to operate this steam-electric plant we will assume a modern high efficiency installation yielding one kilowatt-hour per two pounds of coal. Since one pound of steam yields 1000 B.t.u.'s and there were 48,310,000 lbs. of steam delivered, and one kw-hr. is equivalent to 3,412 B.t.u.'s, we learn 48,310,000 times 1000 divided by 3,412 equals 14,158,851, the number of kilowatt hours to be delivered, requiring a coal consumption of 14,159 tons, or 3460 lbs. per thousand of cubic feet of space to be heated.

The total coal bill for the operations of this plant would therefore become \$42,052.00 against \$14,069.00, and the coal bill per thousand cubic feet of space to be heated would be \$5.14.

The operating costs of a steam generating plant may be roughly calculated by the rule of thumb that the coal bill is 70% of the costs. This will be found to be a very approximately correct ratio. Hence, total operating costs of this plant, converted to an electric generating plant, would be \$42,052.00 times $\frac{100}{70} = \$60,075.00$.

Our total operating expense per thousand lbs. of steam equivalent delivered would thus become \$1.25, or per thousand cubic feet of space heated, \$7.34; and the fixed charges (12% on \$450,000.00) \$1.12 and \$6.59 respectively, yielding a total cost of energy equivalent to one thousand pounds of steam delivered of \$2.37, or per thousand cubic feet of space to be heated, \$13.93.

It should be remarked that the steam cost above given, 96c per 1000 lbs. of steam, which yields the cost of \$5.65 per thousand feet of space to be heated, is in excess of the value of service, as experienced by the operator of this plant, and that the actual heating rate is, and for several years has been not more than, 70c per thousand pounds of steam, which would give an equivalent of $(70 : 96 = 5.47)$ approximately \$4.00 per thousand cubic feet of space heated. Probably the deficit has been customarily ultimately absorbed in rents. But this is unimportant for the purpose of our study. The essential point is that the cost of electric heating to users from this plant would be almost exactly $3\frac{1}{2}$ times what they are now paying for steam heating.

It has already been established that hydro-electric costs of production per kilowatt hour are, even in this country, approximately the same as steam costs, taking into consideration the various disparate elements in the two problems. And if this is true, it follows from the foregoing comparison of relative costs that a hydro-electric plant cannot be used to deliver a heating load on any possible commercial basis.

Summarizing what has been said before as to hydro-electric costs, and disregarding all comparison with costs of generating electric power by steam, this becomes apparent from the following estimate of these costs:

Capital investment	\$200.00 per kw.
Fixed charges (interest, depreciation, insurance, taxes) 12%	24.00 per year
Operating costs	
Plant output (operated at 50% load factor), kw-hr	4380 hours
24.00	
Cost per kw-hr. fixed charges alone ($\frac{24.00}{4380}$)	0.55c per kw-hr.
Required to deliver 5,900,820 B.t.u.'s or heat required for 1000 cu. ft. space*	2160 kw-hr.
Required to deliver 1,000,000 B.t.u.'s or equivalent 1000 lbs. steam*	367 kw-hr.
Fixed charge cost to deliver at plant switchboard heat for 1000 cu. ft. space.....	\$11.88
Fixed charge cost to deliver heat at plant switchboard, equivalent to 1000 lbs. steam.....	\$2.02
*Transmission and distribution losses 20%.	

Further Disadvantages

Comparing this cost, which is, of course, inadequate in that it omits not only all operating expense but also all transmission and distribution charges,

and expenses, it will be seen that the ratio between the cost of the same amount of heating delivered from a modern district steam system, and from a modern hydro-electric plant, would be (on the basis of 1000 cubic feet of space heated) as \$5.65 is to \$11.88, or as 1 is to 2.1, and on the basis of heating equivalent of 1000 lbs. of steam as \$0.96 is to \$2.02, or as 1 is to 2.1 for the heating season. If operating, transmission and distribution costs for the hydro-electric system were added, the ratio would be greater than 4 to 1, probably nearer 5 to 1.

Furthermore, throughout this study it is assumed that the heating load merely carries its own proportionate kilowatt hour burden, that is to say, that a load is found for the plant during the summer months, or the off heating season. It is difficult to believe that this assumption would correspond to facts. Obviously, in a normal system, the heating load comes on the system's annual peak, that is, during the winter months, when the lighting load is the heaviest. Power consumers cannot take power for three, four or five months of the year, but must have a continuous supply. Consequently, the heating capacity would not be available to carry commercial power loads. The only possible load to be carried as a complement to the heating load would be the summer irrigation load, which, however, would require a distinct investment in transmission lines, and like facilities, far distant from the towns where the heating work is done, and furthermore, in proper central station economics, an irrigation load should be an off-peak load, complementing the high priced winter lighting load, because the irrigation load itself cannot stand its own share of the fixed charges and cost of operating the plant, as it is distinctly a low value service. At the rates prevalent in Utah, and those which I have seen in Idaho, an irrigation load will yield, at the maximum, approximately \$18.00 a horsepower per year, which is only about three-fourths of the fixed charges of plant alone, on the basis of calculations which I have used, that is to say, 12% total on \$200 per kilowatt of capacity.

However, it is unnecessary to pursue this subject further, as the study assumes that the company is in some way provided a load which will carry the fixed charges and cost of plant operations during the no-heating months.

A Typical Case of House Heating by Electricity

Let us assume a five or six room bungalow cottage, of the design common in the smaller towns (and also in the cities) of Utah and southeastern Idaho. It would have a heating exposure of about 25 x 15 x 40 feet, or 15,000 cubic feet, and would require, to be comfortably heated in zero weather, an installation of 15 kilowatts delivered to the house. With 25% line and transformer losses from the plant to the house, this would require 20 kilowatts capacity at the central station. At a cost of \$200.00 per kilowatt, this would require \$4000.000 investment in plant capacity alone, to which line, substation and distribution capacity would add at least \$100.00 per kilowatt of station capacity, thus giving a total investment of \$6000.000 for heating plant for this house. If we assume, as we have heretofore

done, that this capacity could be otherwise utilized for one-half of the year, we would still have an investment of \$3000.00 in heating plant for our house with fixed charges at 12%, amounting to \$360.00 per year, to which operating costs must be added. To state accurately what these operating costs would be would require a careful analysis of modern station practice, which I have not had an opportunity to make. The larger part of these costs are incurred beyond the plant switchboard in transmission and distribution, and vary with the particular transmission and distribution systems. Station output costs are disclosed by operating reports of various stations.

The Thirteenth Annual Report of the Reclamation Service, page 35, gives the output cost of the Minidoka plant for the year 1913 (multiplying the kilowatt output by the cost per kilowatt hour, and dividing by the rated capacity) at a trifle over \$5.00 per kilowatt. (This low cost is possible because no interest, taxes or insurance is charged.) The actual costs of distribution per kilowatt sold would probably be at least three times this amount.

If we charge but half of an aggregate cost of \$20.00 to the heating load, the cost of delivering 15 kilowatts to residence heating appliances is increased by \$150.00, giving a total cost of \$510.00 for heating a five room cottage. The same quantity of heat would be produced by direct heating apparatus in the house from approximately 10 tons of coal, at a cost of about \$80.00.

In this statement I have assumed the fixed charges to aggregate 12%. This would allow $6\frac{1}{2}\%$ interest, $3\frac{1}{2}\%$ depreciation, 2% taxes and insurance. If the state should own and operate power plants, and could finance such plants with money borrowed at $4\frac{1}{2}\%$, it could save about 4% in interest and taxes, or about \$16.00 per year per kilowatt of capacity delivered, in fixed charges. This, however, would affect our heating load on the assumptions made above only by one-half of this amount, or \$8.00 per year per kilowatt, or \$120.00 per year per residence having 15 kilowatts demand, giving us a net heating bill for one of these residences of about \$390.00 as against \$510.00. So too, if it be contended that the installation costs assumed here are too high, it would make very little difference, from a practical standpoint, if the percentage of error should be as high as 50% in the total installation, because that would decrease the fixed charges only by one-third, or to \$240.00 for a 15 kilowatt heating plant in private ownership, or \$160.00 under state ownership. The operating expense would still remain the same, giving a heating cost of \$310.00 to \$390.00. However, I am confident that my former figures are much more nearly correct for continuous load capacity of stations as distinguished from mere rated capacity of machines, or mean flow of streams, than my latter.

Compared with Coal

Another way of attacking the problem is to find the electric heat equivalent of one ton of bituminous coal and to find at what price electric energy would

have to be sold to make electric heat the same price as heat from coal.

Let us assume a house heating plant to have 60% efficiency, that a ton of coal costs \$10.00 and that one pound of coal has 12,000 B.t.u.'s. Then there would be delivered from one ton of coal $12000 \times 2000 \times 0.6 = 14,400,000$ B.t.u.'s, which divided by 3412 = 4220 kw-hr. equivalent to one ton of coal. This would have to be sold at the electric heater for \$10.00 or 0.23c per kw-hr., which is impossible, commercially considered.

The problem of heating on any extensive scale would be very much complicated by the very sparse use of heating appliances. If it be assumed that a few well-to-do people in the town could pay from \$375.00 to \$650.00 a year for heating a small residence, they would be so very few that the installation required for their service would be rendered still more disproportionate in cost to the value of the service rendered by the lack of use of these facilities by their poorer neighbors, so that the heating costs must be recalculated again to a figure where even the favored few would find the heating service too costly to be practicable.

ELECTRIFYING ITALY'S RAILWAYS

Great savings in the use of coal, according to the Italian Bureau of Public Information, have been effected in Italy in the past few years through the electrization of railroads and harnessing the water-power of the country to generate electricity. The percentage of railroads electrified in Italy from 1900-1915 is greater than in any other European country, and the economies resulting have been gratifying.

Electric traction of railroads began in Italy in 1900 with installations on the Varesina Line, which runs through Milan, Gallarate, Varese and Ponteceresio, and on the Valtellinese Line which runs from Lecco to Chiavenna.

Railways which run on mountainous routes and carry heavy trains have been installed with different systems. The principal mountain routes electrified are the Moncenisio Line, the Ceva-Port Savona Line, the old line of Giovi and the new supplementary Giovi line. These cover some of the most difficult territories traversed by any of the railroads in Europe.

The Moncenisio Line is the longest of the mountain railways. It is 8.5 miles long, travels at an altitude of more than 1,000 yards above sea level and is continuously on the ascent. It has a nominal carrying capacity of 640,000 tons per mile and actually carries 240,000,000 tons. The Ceva-Port Savona Line is a series of steep inclines and declines. The Giovi Line has the most rapid descent of any railroad in Europe and the supplementary Giovi Line carries the heaviest traffic in Italy.

The perfect systems installed on these mountain routes has made possible the increase in the carrying capacity and speed of the railways. There is at present under consideration the electrification of 1,250 miles more of railways.

DATA ON CENTRAL STATIONS IN THE WEST

Preliminary figures on central electric light and power stations in several of the western states have been issued by the Bureau of the Census. They were prepared under the supervision of Eugene F. Hartley, Chief Statistician for Manufactures.

The statistics relate to the years ending Decem-

ber 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; those operated by the Federal Government and state institutions; and those that were idle or in course of construction.

ELECTRIC LIGHT AND POWER STATIONS: NEW MEXICO, 1917

	1917	1912	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	29	21	15	93.3	38.1	40.0
Commercial	25	18	15	66.7	38.9	20.0
Municipal	4	3	—	—	33.3	—
Income	\$894,207	\$497,895	\$292,582	205.5	79.6	70.1
Electric service	\$874,317	\$488,422	\$289,962	201.5	79.0	68.4
All other	\$ 19,890	\$ 9,473	\$ 2,720	631.2	110.0	248.3
Total expenses, including salaries and wages	\$844,575	\$449,516	\$226,937	272.2	87.9	98.1
Number of persons employed.....	256	158	83	208.4	62.0	90.4
Salaries and wages.....	\$223,510	\$119,088	\$ 66,981	233.7	87.7	77.8
Total horsepower	17,108	11,015	4,548	276.2	55.3	142.2
Steam engines:						
Number	37	32	25	42.3	15.6	23.1
Horsepower	13,226	8,428	4,035	227.8	56.9	108.9
Internal-combustion engines:						
Number	22	9	—	—	144.4	—
Horsepower	3,262	1,770	—	—	83.7	—
Water wheels:						
Number	7	9	6	16.7	-22.2	50.0
Horsepower	630	817	513	22.8	-22.9	59.2
Kilowatt capacity of dynamos.....	12,713	7,981	3,789	235.5	59.3	110.6
Output of stations, kilowatt hours.....	17,244,768	9,027,824	4,614,349	273.7	91.0	95.6
Stationary motors served:						
Number	729	539	195	273.8	14.1	227.7
Horsepower	7,626	4,084	1,231	519.5	86.7	231.8
Number of street lamps:						
Arc	13	247	(²)	—	-94.7	—
Incandescent, etc.	2,288	627	(²)	—	264.7	—

(¹) A minus sign (—) denotes decrease.
(²) Not available.

The figures presented for New Mexico show substantial gains for each five-year period. From 1912 to 1917 the income increased \$396,312, or 79.6 per cent, compared with a gain of \$205,213, or 70.1 per cent, from 1907 to 1912. From 1912 to 1917 also the actual increase in expenses, \$395,059, or 87.9 per cent, was greater than from 1907 to 1912, when the gain was \$222,579, or 98.1 per cent. From 1912 to 1917 the output of stations increased 8,216,-

944 kilowatt hours, or 91 per cent, compared with a gain of 4,413,475 kilowatt hours, or 95.6 per cent, from 1907 to 1912. The actual increase in dynamo capacity was greater from 1912 to 1917 than for the prior five-year period, but the percentage of increase was less for the later than for the earlier period. In harmony with the showing for street lamps in most of the states, the use of arc lamps for street lighting shows a decided decrease from 1912 to 1917.

ELECTRIC LIGHT AND POWER STATIONS: OREGON, 1917

	1917	1912	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	68	65	61	11.5	3.0	8.2
Commercial	53	54	50	6.0	-1.9	8.0
Municipal	15	12	11	36.4	25.0	9.1
Income	\$2,577,297	\$1,422,703	\$1,965,245	31.1	81.2	-27.6
Electric service	\$2,454,047	\$1,380,785	\$1,840,165	33.4	77.7	-25.0
All other	\$ 123,250	\$ 41,918	\$ 125,090	-1.5	194.0	-66.5
Total expenses, including salaries and wages	\$2,276,169	\$1,205,738	\$1,283,560	77.3	88.8	-6.1
Number of persons employed.....	636	(⁴) 532	467	36.2	19.5	13.9
Salaries and wages.....	\$ 583,195	\$ 387,119	\$ 415,424	40.0	60.6	-7.0
Total horsepower	68,706	46,015	126,815	-45.8	49.3	-63.7
Steam engines:						
Number	46	54	66	-30.3	-14.8	-18.2
Horsepower	27,062	15,879	24,581	10.1	70.4	-35.4
Internal-combustion engines:						
Number	15	9	6	150.0	66.7	50.0
Horsepower	578	334	182	217.6	73.1	83.5
Water wheels:						
Number	80	60	72	11.1	33.3	-16.7
Horsepower	41,066	29,802	102,052	-59.8	37.8	-70.8
Kilowatt capacity of dynamos.....	47,917	32,416	32,587	47.0	47.8	-0.5
Output of stations, kilowatt hours.....	107,886,973	58,789,342	92,807,992	16.2	83.5	-36.7
Stationary motors served:						
Number	3,284	1,527	2,072	58.5	115.1	-26.3
Horsepower	31,682	15,843	20,452	64.9	100.0	-22.5
Number of street lamps:						
Arc	489	1,128	(⁵)	—	-56.6	—
Incandescent, etc.	10,363	6,239	(⁵)	—	66.1	—

(¹) The decrease from 1907-1912 is due to the fact that certain companies, included among the central stations for 1907, were later taken over by the railways and are included with the electric railway industry for 1912.

(²) A minus sign (—) denotes decrease.

(³) Exclusive of \$2,047,853 in 1917 and \$2,327,822 in 1912, reported by street and electric railway companies as income from sale of electric current.

(⁴) Includes approximately 100 part-time employees.

(⁵) Not available.

The figures presented for the state are fairly comparable for 1912 and 1917. The decreases shown for the period 1907-1912 are due mainly to the fact that certain establishments reported as central electric light and power stations for 1907 were later taken over by electric railways and were therefore reported with them for 1912 and 1917. From 1912 to 1917 the total income increased by \$1,154,594, or

81.2 per cent; the expenses, by \$1,070,431, or 88.8 per cent; the horsepower, by 22,691, or 49.3 per cent; the kilowatt capacity of the dynamos, by 15,501, or 47.8 per cent; and the output of stations, by 49,097,631 kilowatt hours, or 83.5 per cent. As in in the cases of practically all the states, the use of arc lamps for street lighting shows a pronounced decrease.

ELECTRIC LIGHT AND POWER STATIONS: NEVADA, 1917

	1917	1912	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	14	8	9	55.6	75.0	-11.1
Commercial	13	7	9	44.4	85.7	-22.2
Municipal	1	1	—	—	—	—
Income	\$ 938,929	\$ 618,942	\$ 372,108	152.3	51.7	66.3
Electric service	\$ 833,088	\$ 607,597	\$ 352,959	136.0	37.1	72.1
All other	\$ 105,841	\$ 11,345	\$ 19,149	452.7	832.9	-40.8
Total expenses, including salaries and wages	\$ 562,359	\$ 428,255	\$ 245,291	170.0	54.7	74.6
Number of persons employed.....	190	147	78	143.6	29.3	88.5
Salaries and wages.....	\$ 144,012	\$ 113,635	\$ 77,264	86.4	26.7	47.1
Total horsepower	16,832	15,420	6,980	141.1	9.2	120.9
Steam engines:						
Number	5	6	4	25.0	-16.7	50.0
Horsepower	1,100	2,210	235	368.1	-50.2	840.4
Internal-combustion engines:						
Number	8	8	5	33.3	—	33.3
Horsepower	617	670	485	27.2	- 7.9	38.1
Water wheels:						
Number	21	13	9	133.3	51.5	44.4
Horsepower	15,115	12,540	6,260	141.5	20.6	100.3
Kilowatt capacity of dynamos.....	12,353	10,513	5,690	117.1	17.5	84.8
Output of stations, kilowatt hours.....	\$3,846,178	\$4,969,772	\$9,621,730	81.8	19.7	51.8
Stationary motors served:						
Number	970	553	411	136.0	75.4	34.5
Horsepower	15,874	12,584	6,850	131.7	28.2	80.8
Number of street lamps:						
Arc	14	204	(?)	—	-93.1	—
Incandescent, etc.	1,003	401	(?)	—	150.1	—

(¹) A minus sign (—) denotes decrease.

(²) Not available.

The figures show general increases at each succeeding census. As a rule, however, the gains are greater for the later five-year period. From 1907 to 1912 the number of establishments decreased from 9 to 8, but from 1912 to 1917 it increased to 14. The income and expenses increased during both five-year periods, and it is noticeable that the percentage of increase in expenses was greater than that for income; from 1912 to 1917 the income increased \$319,987, or 51.7 per cent, and the expenses \$234,104, or 54.7 per cent; from 1907 to 1912 the increase in income amounted to \$246,834, or 66.3 per cent, and

in expenses to \$182,964, or 74.6 per cent. From 1907 to 1912 there was an increase in each of the three classes of power shown, but from 1912 to 1917 the horsepower of steam units and of internal-combustion engines decreased, while that of water wheels increased 2,575 horsepower, or 20.5 per cent. From 1912 to 1917 the output of stations increased 8,876,406 kilowatt hours, or 19.7 per cent, compared with an increase of 15,348,042 kilowatt hours, or 51.8 per cent, from 1907 to 1912. In common with other states, Nevada shows decreased use of arc lamps for street lighting purposes.

ELECTRIC LIGHT AND POWER STATIONS: UTAH, 1917

	1917	1912	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	47	46	31	51.6	4.4	45.2
Commercial	25	28	22	13.6	-10.7	27.3
Municipal	22	17	9	144.4	29.4	88.9
Income	\$5,444,807	\$1,549,265	\$655,241	718.5	251.4	132.9
Electric service	\$4,965,930	\$1,530,060	\$627,332	691.6	224.5	143.9
All other	\$ 478,877	\$ 19,205	\$ 37,909	1163.2	2393.5	-49.3
Total expenses, including salaries and wages	\$4,018,963	\$1,206,729	\$461,675	770.5	233.0	161.4
Number of persons employed.....	1,215	401	193	513.6	203.0	102.5
Salaries and wages.....	\$ 937,869	\$ 365,399	\$159,686	487.3	156.7	128.3
Total horsepower	226,595	60,588	35,950	530.3	274.0	68.5
Steam engines:						
Number	15	5	10	50.0	150.0	-40.0
Horsepower	34,189	1,000	1,279	2573.1	3318.9	-21.8
Internal-combustion engines:						
Number	—	—	—	—	—	—
Horsepower	—	—	—	—	—	—
Water wheels:						
Number	112	63	45	148.9	77.8	40.0
Horsepower	192,406	59,588	34,671	454.9	222.9	71.9
Kilowatt capacity of dynamos.....	147,359	37,935	33,592	338.7	288.5	12.9
Output of stations, kilowatt hours.....	466,995,136	85,634,658	51,672,661	657.2	439.0	40.5
Stationary motors served:						
Number	1,046	1,044	406	157.6	0.2	157.1
Horsepower	126,556	37,490	5,519	2193.1	237.6	679.3
Number of street lamps:						
Arc	2,638	321	(?)	—	721.8	—
Incandescent, etc.	7,697	5,237	(?)	—	47.0	—

(¹) A minus sign (—) denotes decrease.

(²) Not available.

The figures presented for Utah show a remarkable growth in the central electric light and power stations, more pronounced during the later five-year period, from 1912 to 1917. The total number of companies reporting increased 14 from 1907 to 1912 and only two from 1912 to 1917. The number of stations, however, has but little significance because of the tendency to combine in a single system two or more plants that previously reported as independent stations. From 1912 to 1917 the income increased \$3,895,542, or 251.4 per cent, compared with an increase of \$844,024, or 132.9 per cent, from 1907

to 1912. The expenses increased correspondingly, 233 per cent and 161.4 per cent, respectively. From 1912 to 1917 the output of stations shows a gain of 360,360,478 kilowatt hours, or 439 per cent, compared with an increase of 24,997 kilowatt hours, or 40.5 per cent, from 1907 to 1912. The total horsepower increased 274 per cent and 68.5 per cent during the respective five-year periods. Unlike most of the states for which such figures are presented, Utah shows a large increase from 1912 to 1917 in the number of arc street lamps, the gain in incandescents being comparatively insignificant.

UNIVERSITY COOPERATIONS

(An editorial on "The New University" which appeared in the Journal of Electricity for Dec. 15, 1918, aroused considerable interest in university circles on the Pacific Coast. The following data on the activities of the University of Washington was sent in reply and is here reproduced as showing to what a great extent the modern university is today at work in the service of its community, living up to the ideals of cooperation suggested in the Journal of Electricity editorial.—The Editor.)

A university, because it deals with the most advanced phases of knowledge and discipline, acquires other functions than instruction. Every true university is an institution for scientific research. It seeks knowledge in its laboratories and beyond them in the real world of practical issues. That search for truth outside of academic walls requires the cooperation of many agencies, and a university becomes rich in significant knowledge if it has them.

The Great Worth of University Cooperations.—But there is another side to that intellectual cooperation. The new truths of science are valuable chiefly for their human uses—spiritual, social and economic. The routing of truth through the student's thought is indirect. It takes a long time to get into industry, commerce and other human affairs. It has an immediate service to the public to perform. It applies its facts and its methods to the problems of practical and responsible life, whenever an instrument of public welfare offers its cooperation.

The cooperations of the University of Washington are grouped as: (I) Cooperations with national agencies; (II) with the state; (III) with the municipality; (IV) in industry and commerce; (V) with colleges and universities; (VI) gifts; (VII) loans.

I. Cooperations with Federal Agencies

1.—Pacific Northwest Experiment Station, U. S. Bureau of Mines.—The United States Bureau of Mines maintains a mining and metallurgical experiment station for the Pacific Northwest and the coast regions of Alaska at the College of Mines. The headquarters of the station, from which all operations in this territory are directed, are in the Bureau of Mines Building, between Mines and Bagley halls. An analytical laboratory is in the same building, while the electric furnace and other equipment used by the bureau in cooperation with the college are housed in the Mines building. At present the principal investigations being conducted by the station are in electro-metallurgy, and in the mining, treatment and uses of coal.

2. Mines Rescue Training Station, U. S. Bureau of Mines.—The Mines Rescue Training Station of the United States Bureau of Mines occupies a separate building near the Mines Building. The "smoke-room," fitted with track and car, overcast airway and smudge floor, is the largest of its kind in the country. Several sets of rescue and resuscitation apparatus are kept on hand for practice as well as for use in mine rescue work, or emergencies such as asphyxiation, drowning, electric shock, and the like. A lamp-testing machine is in use for testing safety lamps in mixtures of gas and air under varying conditions of velocity; this machine is a duplicate of the one at the Pittsburg laboratory of the United States Bureau of Mines. A White automobile truck of 45 h.p., with a capacity of six men and six sets of rescue apparatus, is kept in constant readiness for service in the nearby mining fields of the state.

3. Timber Testing Laboratory, U. S. Forest Service.—Laboratory work in timber physics is carried on the U. S. Forest Service Timber Testing Laboratory, operated in cooperation with the University. This laboratory is magnificently equipped with seven large testing machines for static and impact loading, circular and band saws, planer and other shop equipment for wood-working.

4. Wood Distillation Plant, U. S. Forest Service.—This plant consists of a retort of one-half cord capacity per

charge, gas tank, and refining apparatus. The purpose of this experimental station is to discover by-products which may become commercially profitable in this region.

5. Medicinal Plant Garden, U. S. Bureau of Plant Industry.

6. Pacific Northwest Research Station, U. S. Bureau of Education.

7. Cooperation with Federal Board for Vocational Education.

8. Navigation Schools, U. S. Shipping Board.

9. Marine Engineering School, U. S. Shipping Board.

10. Employment Management School, U. S. Industries Board.—The course in employment management was given at the express request and under the supervision of the industrial service sections of the several departments at Washington. It emphasizes the function of personnel management and the necessity of training groups of competent employment managers capable of maintaining the proper relations between employer and employee.

11. Cooperation with War Department.

12. Cooperation with the U. S. Navy.

13. Cooperation with the U. S. Marine Corps.

14. Special Investigations for the Federal Government Conducted by the College of Business Administration.—The college contributed a study of food prices to the Macey Commission on shipyard labor adjustments. The fuel administrator for the state of Washington called upon the college for a preliminary survey of the fuel problem and the methods to be used in solving it for the state. This investigation extended over a period of six weeks, and consisted of gathering statistical data which would serve as a basis for fuel prices. Considerable work was also done relative to the routing, loading and unloading of fuel.

The college investigated lumber camp conditions for Secretary of Labor Wilson's Mediation Commission.

An investigation of the fish industry was made for the State Food Administrator.

II. Cooperations with the State Government

Membership on State Boards.

State Geologist—Head of the Department of Geology.

State Chemist—Dean of the College of Pharmacy.

Special Investigations for State Department.

Cooperation with the State Commissioner of Fisheries—

Several investigations were conducted by University specialists at the request of the State Commissioner of Fisheries.

Cooperation with the State Board of Health.

III. Municipal Cooperations

Observation and Supervised Teaching.

Practice Work in Library Economy.

Municipal Survey of Civil Service Wages.

IV. Cooperations with Commercial and Industrial Agencies

1. College of Business Administration.—During this biennium the staff of specialists associated with the Department of Economics and the School of Business Administration have at the request of various private or public agencies, cooperated upon problems of public import by making the following investigations or surveys:

(1) Cost of living survey from February 1 to July 1 for the flour milling employers and employees of Seattle.

(2) A survey for the Seattle Times Printing Company covering an investigation of the company's financial state-

ment, as well as an investigation of labor conditions and services in the various departments of the plant.

(3) Investigation of the Chinese Exclusion Act and labor conditions for the China Club of the city of Seattle.

(4) An investigation of rate schedules in the various cities of the United States for the Seattle Gas Company.

(5) For the Seattle Chamber of Commerce three studies were made:

a. An investigation relative to exports and imports at the Port of Seattle for the period of 1913 to 1918.

b. A survey of tonnage and shipbuilding conditions to be used for the shipbuilders of the Pacific Northwest.

c. A report on the trend of prices, credit extension, bank reserves, interest rate, and general banking conditions.

2. University Engineering Experiment Station.—The industrial cooperations of the University during the past biennium have been too numerous to state in detail. The Engineering Experiment Station has been organized for the special purpose of coordinating the efforts of all the technical departments which aim to solve in scientific terms the industrial problems of this region.

These studies have touched every line of industrial activity, and were designed to foster cooperation in research between individual firms or trade and industrial groups on the one hand and the University staff on the other.

CENTRAL STATION ADVERTISING

THE VALUE OF ADVERTISING to the electrical industry is well told by the story of the campaign of the Bartlesville Interurban Railway Company of Oklahoma for a seven cent fare. It only remains to be added that the increase was granted. This is how the superintendent of the company tells of the campaign:

Before entering upon this campaign we realized that we were giving poor service. However, we knew that before making any extensive repairs or purchasing additional equipment, additional revenue must be obtained in order to better our service. With these facts in mind we launched an advertising campaign with a view to putting our case directly up to the people and convincing them of our difficulty.

On June 11, 1918, we opened our campaign, running talks in both local papers. After the publication of six talks we found we were getting very little criticism except from some of the most prominent business men, and these criticisms were, for the most part, constructive.

In view of the fact that the bulk of the people apparently were not reading our talks we had posters painted, reading as follows:

"Is the Interurban Justified in Increasing Its Unit Street Car Fare from Five to Seven Cents? Read 'PUP' Talks in Both Papers and Offer Your Objection."

These posters were painted on 14 by 22 inch cardboard and carried inside the cars. The appearance of this poster did the work. Criticisms both constructive and destructive were frequent. The 7-cent fare became the topic of car riders, several letters were printed by the newspapers and we also received some personal letters. Before entering our campaign we were prepared for a long series of talks and any criticisms that might develop. However, after running 16 talks it seemed that we had accomplished our purpose and we closed the campaign.

We then drew up three resolutions, the general form of which was listed as the seventeenth talk. W. H. Merritt, general manager, first obtained the approval of the Bartlesville Chamber of Commerce to one resolution; then went to the Dewey commissioners and secured their approval and signatures to the second, and then went before the Bartlesville city commissioners and secured their approval and signatures to the third resolution. This was a wise and judicious move, and without a doubt contributed largely to the speedy and favorable action of the State Corporation Commission. L. A. Ramsay, then secretary of the company, carefully compiled a very complete, concise and clear statement of financial conditions, which was embodied in the petition for our increase. After this was done Messrs. Merritt and Ramsay in person presented our petition with the signed resolutions and a complete set of our 17 talks attached, to the State Corporation Commission. This presentation was made about July 2, and so pleased were the commissioners with the manner of presentation that we were permitted a hearing ahead of many cases filed before us. To be specific, our hearing was set for July 12, and at that time Messrs. Merritt and Ramsay again appeared before the Commission. No opposition was offered and they were practically assured of the commissioners' approval.

On July 19 we received authorization from the State Corporation Commission to put a 7-cent unit fare into effect on and after Aug. 1. On July 27 painted posters were placed in our cars notifying the public of the increase. On July 30 and 31 the newspaper ad. listed as our eighteenth talk was run and the fare became effective Aug. 1.

This we believe gives in detail our procedure in obtaining the 7-cent fare, and I can think of no higher compliment to pay Mr. Merritt than in citing these two facts:

1. Within 40 days after starting the campaign authorization was given for a 40% increase in street car fares.

2. The Corporation Commission said: "Never in our history have we had a better or more complete petition presented to us."

The matter used in the talks included: (1) Introduction; (2) Capital; (3) Comparative value of money, using 260 commodities; (4) Specific Cost increase; (5) Summary and definite statement of drive for increased fares; (6) Why the cost of operating a small utility is greater than that of a large one; (7) Reference to No. 6, and list of large cities having increased fare; (8) Business principles in regard to a special and fixed price; (9) General summary of past talks as an introduction to the correspondence between President Wilson and Secretary McAdoo; (10) Wilson-McAdoo correspondence; (11) Use of verse published in Doherty News; (12) Electric rapid transit — the union; (13) Letter from United States Chamber of Commerce; (14) Letter from John Skelton Williams, comptroller of the currency; (15) Extracts from Public Service Corporation and War Finance Corporation statements; (16) Closing Talk; (17) Publication of resolution, and (18) Announcing increase of fare.

ELECTRIC ARC WELDING

BY F. A. ANDERSON

(The importance which is being given the arc welding process in shipbuilding has brought this art forward into public interest. Although on the whole it has been slow in development, arc welding has possibilities which have already greatly modified ship building and promise further developments. With this issue, the Journal of Electricity initiates a series of authoritative articles on this subject. The author's experience as electrical inspector with the U. S. Government has given him opportunity to study the subject from almost every angle. He was connected in this capacity with one of the large shipyards of the East before coming to the Pacific Coast.—The Editor.)

The term "welding" is employed to denote the combination of two pieces of metal into a homogeneous whole by fusing them together. Heat is, therefore, an essential to the process and the term "electric welding" is applied to that form of welding in which the necessary heat is produced by means of an electric current.

In using the electric current to produce the required heat there are two main methods. The heat may be due to the passing of current through the resisting of metals in contact, or it may be produced by the electric arc.



Arc welding motor gear cases, showing the shield and the method of operating

In resistance welding the metals to be welded are placed in contact and when the necessary temperature has been reached through the passing of the electric current, pressure is applied. At the same time the current is cut off. Spot and butt-welding are the principal methods employing the resistance process.

In arc welding, the necessary heat is gained from the electric arc, as the name implies. The actual technic of the process will be dealt with in future articles. At present we are concerned mainly with the different welding machines which have been and are now being used.

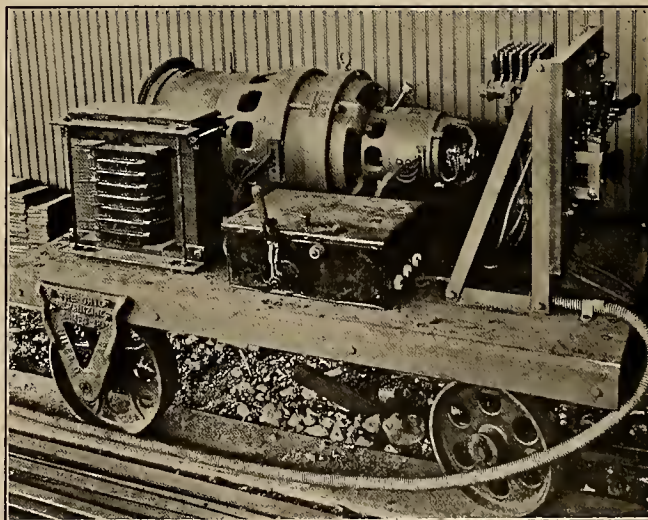
Three Processes —

It may be remarked, however, that there were originally three different arc welding processes, named after the inventors or early developers of the art. The processes have advanced so greatly since their first invention that the original names are hardly ever used now. In spite of the great progress which has been made in arc welding, much greater progress might have been made had it not been for

two causes. The first is due to the fact that, until comparatively recent years, some manufacturers of electric arc-welding machines have been inclined to look upon their product as a sort of side line, hardly to be taken seriously; and the second to those who, accrediting unto themselves superiority, safeguarded their processes with a shield of mystery which might be compared with the protection afforded the casual observer from the glare of the arc.

The Zerener process employed positive and negative carbons in V form. The arc was forced toward the work to be welded by an electro magnet. The electrode or welding-rod was fed into the arc. This process is so rare now, however, that it is practically obsolete.

The second method was known as the Bernardos process. By this process a carbon was used for one side of the circuit, the other being formed by the work itself. No electric magnet was necessary. As



A self-contained one-man arc welding outfit mounted on a truck

in the Zerener process, the electrode was fed into the arc. This process is now more generally known as "carbon welding" and is quite extensively used on heavy work, in electric cutting and in certain cases where a more satisfactory union of the metals can thus be obtained.

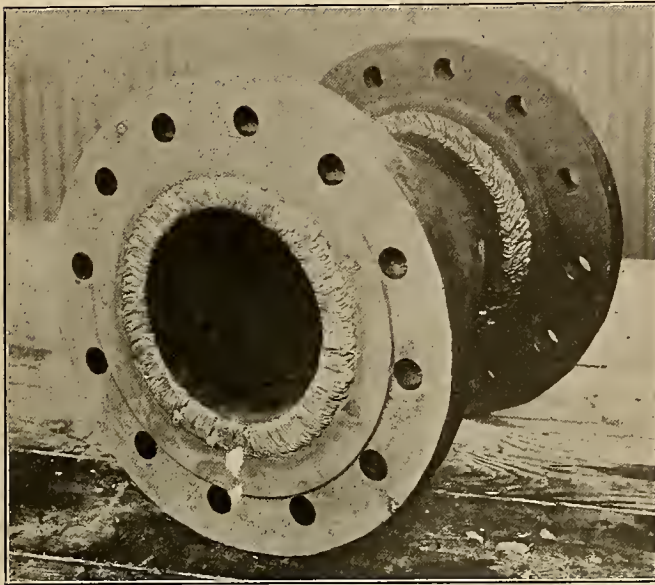
In the Slavianoff process the electrode, or welding-rod, itself forms one side of the circuit, which is completed by the work to be welded. The electrode melts by the heat of the arc and is fused directly with the other metal. This process is so commonly used now, that unless definitely qualified, the term "arc-welding" may be regarded as synonymous with the Slavianoff process.

There are four principal points from which electric arc-welding may be viewed: the machine,

the operator, the electrode and the material to be welded. It is with this first point that the present article is concerned. Later articles will deal with the other points in the order named.

The Machines Employed —

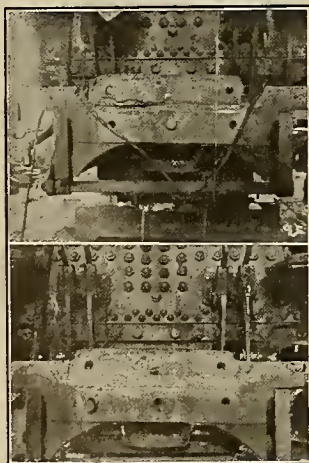
In most arc welding work, the current required at the arc ranges from 80 to 180 amperes at from 12 to 25 volts, the higher amperage requiring the lower voltage. It is obvious, therefore, that there is a



A typical arc weld

great deal of waste energy in the circuit which employs the usual 125 volts with resistance interposed to obtain the required drop. Yet this was the early method of attaining the desired result, and is in the present day still used by one process, which employs a coated electrode.

Gradually machines were developed for this kind of work. First came the motor generator in which the generated voltage ranged, according to make,



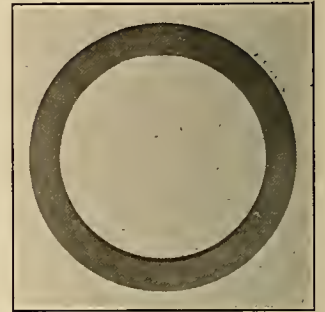
A locomotive tail piece before and after welding, indicating the type of problem solved by the arc welding process. The resulting weld is capable of withstanding severe strain.

from 60 to 80 volts. In each case the machine was flat compounded, delivering a constant voltage at all ranges of load, from zero to full. These machines were made in various sizes and accommodated from two to eight operators. The machines were known as two, five or eight men sets, according to the number of operators supplied.

For each operator there was provided a bank of resistance switches, contact devices, etc., in all a very elaborate installation, and one which resulted in a considerable saving of energy. The motor generator was usually located in some central place, with long heavy leads carried to the "welding stations" in much the same manner as a small power station. The initial cost was great, but in practically every instance they have proved a paying investment, and many are still in operation, rendering faithful and efficient service.

COPPER WELDED RING

One of the non-ferrous metals, hitherto supposed impossible of welding. Here is a sample of a very successful arc-weld. The area has not been reduced nor the ring in any way affected. It is impossible, in fact, to detect the point where the weld was made... This ring is on file in the office of the Journal of Electricity and may be inspected by anyone interested.



Probably the next development was a motor generator in which a lower voltage was generated, although the constant voltage principle was maintained. There was still, also, a large amount of resistance used in the arc circuit. These machines were a considerable improvement in that they were portable and could thus dispense with the great first cost of a central generating station and distribution system.

One machine was designed which used the dynamotor principle and another of motor-generator type which generated a voltage as low as 35 volts, although both used constant voltage and resistance in the arc circuit. This last-mentioned voltage is probably as low as it is safe to go, as less makes "striking the arc" very difficult. It would be more desirable, from this point of view, slightly to increase the voltage.

All of these systems use contacting devices and other appliances operated directly by or in unison with the arc.

Next there came into the field the one-man machine in the form of a specially designed motor-generator which dispensed with practically all resistance in the arc circuit. This generator was so arranged that it would give ample voltage on open circuit to strike the arc, and yet, under load the voltage would be reduced proportionally to the amperage drawn at the arc.

Machines such as this are known as constant wattage, variable voltage, or constant heat machines. They employ no contactors or automatically operating devices within the arc circuit. So far as is known there are only three types of machines similar to this at present manufactured. Each produces the result in a slightly different way, but all result in a greatly increased saving of hitherto wasted energy.

Another system uses the old series,—arc principle. It is designed to supply several operators and contemplates carrying a constant amperage, increasing the voltage for each operator. It depends on contact devices, resistance in circuit, coils in shunt

and series, for each operator. All of these must work in harmony to obtain success. This system reverts to the central station method, employing a three unit machine with variously located welding stations, but on account of increasing the volts instead of the amperes, the welding mains are not of so large capacity.

The machines herein described all employ direct current at the arc and most of them may be operated on the motor end from alternating current. They all possess merit and each claims for itself a particular adaptability to meet the varying demands of service.

It therefore rests with the engineer to determine his own requirements, to weigh the value of the

central location and special distribution system against that of the more portable machine on an existing distribution system, to judge each machine for its ability to meet his particular service, and to consider its elasticity in relation to and in unison with his program of progress and development.

While alternating current is best adapted to resistance welding and has sometimes been used for producing the arc in arc-welding, it has never been a pronounced success for that purpose. In this and the following articles it will be assumed that direct current is used at the arc.

The next article will deal with the technic of the operator, upon which much of the success of the art depends.

FILING SYSTEM FOR CENTRAL STATION USE

BY C. C. HOGAN

(After much experimentation the Dewey Decimal System was decided on by the Southern Sierras Power Company as the only adequate basis for a filing system. The principles on which the adaptation was made were briefly stated in the February 15th issue of the Journal of Electricity. The actual system as adopted is here given as an example of how the general system may be fitted into the needs of a complex organization. The individual subdivisions will perhaps vary with the particular concern but the principles of the following tabulation will prove helpful and generally applicable.—The Editor.)

For the purpose of classifying and filing the correspondence of the associated companies of the Southern Sierras Power Company, a filing classification has been compiled, in which the decimal system of numbering subjects is used.

By this plan of numbering, all subjects that may arise in the course of the business are first segregated into seven general groups, or Divisions, such for instance as "100. Administration"; "200. Engineering"; "300. Operating"; etc. These Divisions are each assigned a series of one hundred numbers ("Hundreds") beginning with 000. and ending with 600.

Each Division is then subdivided into ten Sections by which the Primary subjects of each Division are segregated. The Sections are assigned the "Tens" series in each hundred, beginning with 00., followed by 10., 20., etc. The Primary subjects in all but "000. General" and "100. Administration" are for the most part composed of the different classes of business in which the associated companies are engaged, including "30. Electric," "40. Railway," "60. Ice," etc. The numbers assigned to Primary subjects are uniform throughout all Divisions (except "000. General" and "100. Administration") so that the "30." series always represents "Electric," "40." "Railway," etc., no matter in which Division appearing.

After segregating into Sections, the Primary subjects are then subdivided into Secondary Subjects, occupying the "Unit" position, viz., 1., 2., etc., there being available, of course, numerical positions for ten Secondary Subjects in each Section.

The classification given herewith, with few exceptions, ends with the Secondary Subjects (Units) thus providing in excess of five hundred subjects which it is believed is ample to satisfactorily care for the correspondence at most of the plants and stations. The complete classification in use at the

general offices is worked out in much more detail, some subjects occupying the decimal thousandths position or lower.

000. General —

This Division, as the title signifies, is intended to carry such subjects of a miscellaneous or general character as cannot be assigned to either of the remaining six Divisions.

- 000. Miscellaneous
 - 001. Associations
 - 002. Civic Organizations
 - 003. Clubs, Societies, etc.
 - 004.
 - 005.
 - 006.
 - 007.
 - 008.
 - 009.
- 010. Contracts, Reports, etc. (Miscellaneous)
 - 011. Government Reports
 - 012. Reports of Other Companies
 - 013.
 - 014.
 - 015.
 - 016.
 - 017.
 - 018.
 - 019.
- 020. Political. (Miscellaneous)
 - 021. Elections
 - 022. Political Appointments
 - 023.
 - 024.
 - 025.
 - 026.
 - 027.
 - 028.
 - 029.
- 030. Legislation. (Miscellaneous)
 - 031. Federal Legislation
 - 032. State Legislation
 - 033. Territorial and Insular Legislation
 - 034. County Legislation
 - 035. Municipal Legislation
 - 036.
 - 037.
 - 038.
 - 039.
- 040. Legal. (Miscellaneous)
 - 041. Legal Advice, Consultation, Routine
 - 042. Decisions and Opinions
 - 043. Litigation—Federal Courts and Commissions
 - 044. Litigation—State Courts and Commissions
 - 045. Litigation—Territorial and Insular Courts and Commissions
 - 046. Litigation—County Courts and Commissions
 - 047. Litigation—Municipal Courts and Commissions
 - 048. Miscellaneous Litigation
 - 049.
- 050. Insurance. (Miscellaneous)
 - 051. Fire Insurance
 - 052. Cyclone and Tornado Insurance
 - 053. Burglary Insurance
 - 054. Boiler Insurance
 - 055. Employer's Liability Insurance

- 056. Life, Accident and Sick Benefit Insurance.
- 056.1 Employees Group Insurance
- 057. Automobile Insurance
- 058. Surety Bonds.
- 059.
- 060. Accidents and Personal Injuries. (Miscellaneous)
- 061. Accidents to Public
- 062. Accidents to Employees
- 063. Relations with Hospitals and Physicians
- 064. Personal Injury Claims
- 065.
- 066.
- 067.
- 068.
- 069.
- 070. Publicity. (Miscellaneous)
- 071. Company Publications
- 072. Other Company Publications
- 073. Advertising Publications
- 074. Financial Publications
- 075. Illuminating Signs, Slides, Flood Lights and Street Cars
- 076. Newspapers, Periodicals and Books
- 077. Government Publications
- 078.
- 079.

100. Administration —

This Division embraces such subjects as pertain to Incorporation, Organization and General Management.

- 100. Miscellaneous
- 101. Inspection Trips, Itineraries, etc.
- 102. Conferences, Meetings, etc.
- 103.
- 104.
- 105.
- 106.
- 107.
- 108.
- 109.
- 110. Contracts, Reports, etc. (Miscellaneous)
- 111. Permits and Privileges Granted
- 112. Annual Reports
- 113.
- 114.
- 115.
- 116.
- 117.
- 118.
- 119.
- 120. Organization. (Miscellaneous)
- 121. Acquirement of other Companies
- 121. Incorporations
- 123. Stockholders
- 124. Directors and Trustees
- 125. Executive Committees
- 126. Officers
- 127. Heads of Departments
- 128. Special Committees
- 129. Superintendents
- 130. Employees. (Miscellaneous)
- 131. Applications for Employment
- 132. Employments
- 133. Employees' Records
- 134. Transfers and Promotions
- 135. Resignations and Discharges
- 136. Employees' Organizations, Unions, etc.
- 137. Employees' Savings
- 138. Salaries and Wages
- 139.
- 140. Office Management. (Miscellaneous)
- 141. Offices
- 142. Office Work and Systems, Miscellaneous
- 142.1 Clerical Work
- 142.2 Stenographic Work
- 142.30 Correspondence
- 142.31 Mail—including Telegrams
- 142.32 Mailing Lists and Addresses
- 142.33 Orders Regarding Mail
- 142.34 Lost Mail
- 142.35 Post Office Regulations
- 142.36 Archives—Filing Systems
- 142.37 Telegraph Code Books
- 142.4 Blank Forms
- 143.
- 144.
- 145.
- 146.
- 147.
- 148.
- 149.
- 150. Executive Orders. (Miscellaneous)
- 151. Orders Issued by Board
- 152. Orders Issued by Officers
- 153. Orders Issued by Department Heads
- 154. Orders Issued by Superintendents
- 155.
- 156.
- 157.
- 158.
- 159.

200. Engineering —

This Division includes subjects that relate to surveying, construction, alteration, maintenance, removal or dismantling of plants or equipment; including preparation of plans, specifications, drafting, blue printing and other engineering, office or field work that pertains thereto.

Subjects relating to use or operation of properties

should be carried in the 300. series; those relating to Purchase, Title, Rental or Sale in the 500. series.

- 200. Miscellaneous
- 201. Maps, Blue Prints and Drawings
- 202. Construction Requisitions and Reports
- 203. Work and Job Orders
- 204.
- 205.
- 206.
- 207.
- 208.
- 209.
- 210. Contracts, Reports, etc. (Miscellaneous)
- 211. Plans and Specifications
- 212. Engineering Estimates
- 213. Progress and Inspection Reports
- 214. Preliminary Surveys
- 215.
- 216.
- 217.
- 218.
- 219.
- 220. Non-Utility. (Miscellaneous)
- 221. Real Estate (Unimproved)
- 222. Ranches, Farms, etc.
- 223. Industrial Enterprises
- 224.
- 225. Mining and Oil
- 226.
- 227.
- 228. Irrigation Enterprises
- 229. General Non-Utility Equipment and Supplies
- 230. Electric. (Miscellaneous)
- 231. Hydro Power Plants
- 232. Steam Power Plants
- 233. Gas and Oil Engine Power Plants
- 234. Auxiliary Storage Batteries
- 235. Transmission Lines
- 236. Distribution Lines
- 237. Sub-Stations
- 238. Electric Services, Customers' Installations
- 239. General Electric Buildings and Equipment
- 240. Railway. (Miscellaneous)
- 241. Real Estate, Station Houses
- 242. Shops and Engine Houses
- 243. Transfer and Turn-Tables, Cinder-Pits
- 244. Yards and Terminals
- 245. Freight Depots and Structures
- 246. Roadway, Track and Appurtenant Structures
- 247. Rolling Stock
- 248. Electric Power Transmission
- 249. General Railway Buildings and Equipment
- 250. Ice. (Miscellaneous)
- 251. Real Estate
- 252. Ice Manufacturing Plants
- 253. Ice Storage
- 254. Ice Delivery Equipment
- 255.
- 256.
- 257.
- 258.
- 259. General Ice Buildings and Supplies
- 260. Water. (Miscellaneous)
- 261. Real Estate
- 262. Pumping Stations, Hydraulic Works
- 263. Water Supply
- 264. Pollution and Purification
- 265. Transmission System
- 266. Distribution System
- 267.
- 268.
- 269. Water Services, Customers' Installations
- 270. General Water Buildings and Supplies
- 271. General. (Miscellaneous)
- 272. Real Estate
- 273. General Buildings and Structures
- 274. Machine Shops, Garages and Stables
- 275. Roads, Bridges, and Highway Materials
- 276. Telephone and Telegraph (Miscellaneous)
- 277. Buildings and Structures
- 278. Telephone Exchanges
- 279.
- 280.
- 281.
- 282.
- 283.
- 284.
- 285.
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- 295.1
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- 295.7
- 295.8
- 295.9
- 296. Vehicles and Accessories
- 297. Sidings and Switching Facilities
- 298. Construction Material and Equipment
- 299. General Stores and Supplies

300. Operating —

The Operating Division, as the word signifies, carries subjects relating to the operation or use of the properties owned, leased or controlled by the companies. It will also carry correspondence relating to the production, handling and sale of Agricultural Products (322.).

Subjects relating to Construction, Maintenance or Dismantling of properties belong to the 200. series; those relating to Purchase, Title, Rental or Sale, to the 500. series.

- 300. Miscellaneous
- 301. Patrolling, Watching and Inspecting
- 302. Transportation, Routing and Billing
- 303. Operating Rules and Regulations
- 304. Service Interruptions, Storms, etc.
- 305. Relations with other Companies

306.	
307.	
308.	
309.	
310.	Contracts, Reports, etc. (Miscellaneous)
311.	Operating Contracts
312.	Operating Estimates
313.	Operating Reports
313.91	Auto Mileage Reports
314.	
315.	Inter-Company Contracts
316.	
317.	
318.	
319.	
320.	Non-Utility. (Miscellaneous)
321.	Real Estate (Unimproved)
322.	Ranches, Farms and Agricultural Products
323.	Industrial Enterprises
324.	
325.	Mining and Oil
326.	
327.	
328.	Irrigation Enterprises
329.	General Non-Utility Equipment and Supplies
330.	Electric. (Miscellaneous)
331.0	Hydro Power Plants
331.01	Superintendence
332.0	Steam Power Plants
332.01	Superintendence
333.0	Gas and Oil Engine Power Plants
333.01	Superintendence
334.	Auxiliary Storage Batteries
335.	Transmission Lines
336.	Distribution Lines
337.0	Sub-Stations
337.01	Superintendence
338.0	Electric Services, Customers' Installations
338.01	Testing Customers' Installations
338.02	Connects and Disconnects
339.	General Electric Buildings and Equipment
340.	Railway. (Miscellaneous)
341.	Real Estate, Station Buildings
342.	Shops and Engine Houses
343.	Transfer and Turn-Tables, Cinder-Pits
344.	Yards and Terminals
345.	Freight Depots and Structures
346.	Transportation
347.	Traffic
348.	Electric Power Transmission
349.	General Railway Buildings and Equipment
360.	Ice. (Miscellaneous)
361.	Real Estate
362.	Ice Manufacturing Plants
363.	Ice Storage
364.	Ice Delivery
365.	
366.	
367.	
368.	
369.	General Ice Buildings and Supplies
380.	Water. (Miscellaneous)
381.	Real Estate
382.	Pumping Stations, Hydraulic Works
383.	Water Supply
384.	Pollution and Purification
385.	Transmission System
386.	Distribution System
387.	
388.	Water Services, Customers' Installations
389.	General Water Buildings and Supplies
390.	General. (Miscellaneous)
391.	Real Estate
392.	General Buildings and Structures
393.	Machine Shops, Garages and Stables
394.	Roads, Bridges and Highway Materials
395.0	Telephone and Telegraph (Miscellaneous)
395.1	Buildings and Structures
395.2	Telephone Exchanges
395.3	
395.4	
395.5	Long Distance Lines
395.6	Local Lines
395.7	Local Stations
395.8	Customers' Installations
395.9	General Telephone and Teleg. Equipment and Supplies
396.	Vehicles, Accessories and Teams
397.	Sidings and Switching Facilities
398.	
399.	General Stores and Supplies

400. Finance and Accounts —

The subjects carried in this Division embrace matters relating to the financial operations of the companies, and the reporting and recording thereof.

"Finances" include purchase and sale of Stocks, Bonds and other securities; Receipt and Disbursement of moneys; Banks and Banking; Investments; Taxes and Assessments.

"Accounts" embrace all matters relating to the assembling, reporting and recording of data relating to the financial transaction of the companies.

400.0	Miscellaneous
400.1	Accounting Methods—Instructions
401.	
402.	
403.	
404.	
405.	

406.	
407.	
408.	
409.	
410.	Contracts, Reports, etc. (Miscellaneous)
411.	Financial Statements and Reports
412.	Appraisals. (See Inventories 514.)
413.	Budgets and Financial Estimates
414.	Escrow Agreements
415.	Underwriting Agreements
416.	Mortgages and Trust Deeds
417.	
418.	
419.	General Contracts and Reports
420.	Non-Utility. (Miscellaneous)
421.	Real Estate (Unimproved)
422.	Ranches and Farms
423.	Industrial Enterprises
424.	
425.	Mining and Oil
426.	
427.	
428.	Irrigation Enterprises
429.	General Non-Utility Finance and Accounts
430.	Electric. (Miscellaneous)
431.	Asset Accounts
432.	Liability Accounts
433.	Revenues
434.	Expenses
435.	
436.	
437.	
438.	
439.	General Electric Finance and Accounts
440.	Railway. (Miscellaneous)
441.	Assets Accounts
442.	Liability Accounts
443.	Revenues
444.	Expenses
445.	
446.	
447.	
448.	
449.	General Railway Finance and Accounts
460.	Ice. (Miscellaneous)
461.	Assets Accounts
462.	Liability Accounts
463.	Revenues
464.	Expenses
465.	
466.	
467.	
468.	
469.	General Ice Finance and Accounts
480.	Water. (Miscellaneous)
481.	Asset Accounts
482.	Liability Accounts
483.	Revenues
484.	Expenses
485.	
486.	
487.	
488.	
489.	General Water Finance and Accounts
490.	General. (Miscellaneous)
491.	Asset Accounts
492.	Liability Accounts
493.	Revenues
494.0	Expenses
494.1	Employees' Expense Accounts
495.0	Telephone and Telegraph (Miscellaneous)
495.1	Asset Accounts
495.2	Liability Accounts
495.3	Revenues
495.4	Expenses
495.5	
495.6	
495.7	
495.8	
495.9	General Telephone and Teleg. Finance and Accounts
496.	Investment and Securities
497.	New Financing
498.	Taxes and Assessments
499.	General Finance and Accounts

500. Properties —

This Division carries all subjects relating to the Purchase, Rental, Title, or Sale of Property and Equipment with the following exceptions:

"Commercial Appliances," being closely related to Public Service, is carried in that Division. (See 620. series.)

"Agricultural Products," connected with ranch operations, will be carried in 322. series.

500.	Miscellaneous
500.1	Burglaries and Thefts
501.	
502.	
503.	
504.	
505.	
506.	
507.	
508.	
509.	
510.	Contracts, Reports, etc. (Miscellaneous)
511.	Property Conveyances and Agreements
512.	Abstracts and Certificates of Title
513.	Property Damage Reports
514.	Inventories

MASSACHUSETTS DECISION ON THE ONE-MAN CAR

(In view of the proposed enactment before the California legislature aimed to do away with the one man car, the following comments from the decision of the Public Service Commission of Massachusetts on the use of this type of car by the Bay State Railway Company are of special timely interest. Extended comment on the railway situation will be found on the editorial pages elsewhere in this issue.—The Editor.)

The following extracts from a report of the Massachusetts Public Service Commission in answer to a petition of the Bay State Street Railway Company for the approval of the use of one-man cars over its lines, effectively point out the benefits to the public which may come from the use of such cars and put the justification for their use on other grounds than that of mere economy:

In the "Bay State Rate Case," decided August 31, 1916, the use of one-man cars was strongly urged by the remonstrants against higher fares as a means of giving better service and increasing the net income of the company, and such has also been advocated by operating experts who have examined the property, including Bion J. Arnold, Peter Witt and John A. Beeler. Cars of this type have recently been introduced with success on street railway systems in various parts of the country.

One-man cars have two distinct uses. They may be used merely to decrease expense or they may be used to increase service and business with corresponding increase in cost. On many short lines where traffic is light, frequent service cannot be profitably maintained with ordinary equipment, yet infrequent service means loss of business for people will often walk rather than wait long for a car. By using one-man cars on such routes a 20-minute headway can be changed to a 10-minute headway, or a 30-minute to a 15-minute, with little additional expense and with a gain in service to the public and in traffic to the company.

The objection usually made to one-man cars is that they are dangerous, but recent improvements have robbed this objection of its force. These safety features are operated on much the same principle as the ordinary automatic air brake apparatus, and have no greater delicacy of mechanism. When it is considered that practically all automobiles, including ponderous motor trucks, are one-man operated cars, the comparative safety of electric cars equipped with these devices is evident. It is reported that similar cars in use in other parts of the country have so far proved in actual practice safer, if anything, than the cars operated by two men. This seems to be due chiefly to the fact that all passengers board and alight directly under the eye of the motorman-conductor.

At the hearings the employes of the company opposed the introduction of the new cars, but in the opinion of the Commission this attitude is contrary to their own best interests. The Bay State company has a number of country lines with very low earnings, which are in serious danger of being abandoned unless expense can be decreased, and it also has short-haul lines of the type already mentioned where it ought to be possible to increase both service and patronage by the use of one-man cars, and

to meet jitney competition to much better advantage. The company has recognized the principle that a higher rate of wages ought to be paid to the man who combines the functions of motorman and conductor, and if these cars will accomplish the results anticipated, they will improve a situation which is as threatening to the employes as it is to the company itself.

Objections to the operation of one-man cars which are not now foreseen, may develop in practice, and the Commission must, of course, reserve the right to deal without prejudice with any situation which may arise in future. It has no hesitation, however, in expressing its present opinion,—an opinion which is based upon the advice of competent experts in street railway operation and upon knowledge of experience in other parts of the country,—that properly designed one-man cars can be used in many cases with distinct public advantage.

While there may be economy in initial investment in the adaptation of existing cars for one-man operation, this is offset by loss in operating efficiency. The reconstructed car will certainly consume materially more power than the new car, and it is very likely to attract less traffic. While the commission is willing to approve this car for experimental use, it is not willing to approve the reconstruction of additional cars of similar design until evidence is available as to the comparative efficiency of the two types in actual operation.

The company has failed in its petition, however, to give proper recognition to what is, as we have already shown, perhaps the most important advantage of this new type of equipment—namely, the opportunity offered to improve service and attract traffic. On none of the routes specified does the company propose to use the new cars in this way; in each case they are to be used merely as a means of decreasing operating expense.

The management has informed the Commission that it intends to put one-man cars to this use; but this intention ought to be made unmistakably clear to the public, and ought to be carried into practice at the earliest possible moment. If the two cars now in the possession of the company can be used on some short city line to increase a 30-minute to a 15-minute headway, they ought to be put to such use at once, and to facilitate such action the order entered below, approving certain routes for one-man operation, has been so drawn that it may readily be extended from time to time to include additional routes. If, however, a satisfactory application of the theory of increasing service cannot be obtained with two cars only, the company ought to use its best endeavors to secure a sufficient number of cars for this purpose at an early date and in the meantime inform the public fully as to the plans which it intends to carry into effect.

SPARKS—Current Facts, Figures and Fancy

(The successful transmutation of mercury into gold and radium is modestly reported by a Spanish youth. A substitute for platinum reported by the Chemical Division of the War Industries Board promises to be of greater practical value, however. Figures on the jitney bus, a peace time use for flood lighting and various war items are included in this brief survey of things interesting and curious.—The Editor.)

Nearly 7,000 jitney buses are operating in America. Of these 5,800 are competing with street railways in 153 cities; and these 5,800 jitneys have a gross annual income of nearly \$14,000,000, or about \$2,500 per jitney per annum, the number of employes being 8,200. At the height of "the jitney craze" there were about 20,000 of these buses.

* * *

A recent dispatch from Coblenz would indicate that after-the-war problems in Germany are to be domestic and industrial as well as political. It reads:

"Already in Coblenz there is considerable unemployment, and large numbers of demobilized soldiers are anxious to oust women from the well-paid positions they hold as tramway-car conductors and in other municipal services, as well as in industrial and commercial undertakings. Despite all the efforts of the German authorities to induce the women and girls to go back to household work, little or no progress is being made. The women refuse to resume their pre-war status in the community."

* * *

The longest pipe line in the world extends from the oil fields of Oklahoma and Kansas to the distributing terminus at East Chicago. It is about 800 miles long and one foot in diameter. The engineering difficulties that had to be overcome in the building of this pipe-line were great, notwithstanding the favorable fact that practically the entire line could be laid on flat prairie-land.

* * *

The world's most remote island, so far as getting mail to it is concerned, is unquestionably the Island of Tristan da Cunha, in the middle of the South Atlantic ocean, which is more than a thousand miles from any inhabited land. A woman living there wrote to an English friend in November, 1916. The letter was received in May, 1918. It had been twelve years since they had had a mail delivery on their island.

* * *

During the last one hundred years the average American family has not departed widely from an expenditure of \$24 a year for light. The family of today, however, although spending almost the same sum annually for illumination as was spent by the family of a century ago, secures more than twenty times as much light! This astonishing result is credited entirely to American inventors, engineers and business men.

* * *

The danger of cooking with gas fires on railway trains has been shown by the disastrous effects in recent railway accidents in Germany. As a consequence, the Association for Promoting the Utilization of Electricity has taken steps to coordinate the efforts of manufacturers, public bodies, and other interested parties to secure early tests with the object of introducing electric cooking on the German restaurant cars.

Announcement was recently made from Washington that chemists working under the personal direction of Charles H. McDowell, director of the Chemical Division of the War Industries Board, had succeeded in discovering a substitute for platinum in the manufacture of sulphuric acid by the contact process. It is said that the new material is cheaper than platinum and less susceptible of "poisoning." The raw material from which it is derived is alunite.

* * *

The origin of the League of Nations idea has been credited to various statesmen. Leslie's Weekly insists that there is nothing new under the sun—which is old in itself—and the birth of the idea, so far as history shows, dates back to 1023, when Robert II of France, known as The Godly, and Henry II of Germany, known as The Holy, met one August day on the banks of the River Meuse to discuss universal peace in monarchical and kindly manner.

* * *

Although most of the communication on the front was carried out by electricity, there were other methods. The Huns used 50,000 pigeons during the war and the American and British armies employed 30,000 each. Ninety-seven per cent of the pigeons used returned with their messages. Dogs were used not only for purposes of communication but by the medical corps. Even parrots, until they got too bored with their work, were used in Paris on the Eiffel Tower to warn the residents of the approach of Zeppelins and aeroplanes.

* * *

The flood lights which have been making night work possible in the shipyards of the Northwest are to find new applications in peace times. The warden of the Oregon penitentiary is looking forward to securing some of them for guarding the walls of his establishment. He thinks the lights would not only save extra guard hire, but would prevent escapes such as are now possible because of the darkness. He estimates that each escape costs the state an average of \$500 in the cost of chasing, capturing and returning the convict.

* * *

The Spanish daily Press recently made mention of an "important discovery." A medical student of Alicante, Don German Botella Perez, has discovered an electrical process by which mercury can be decomposed, leaving a residue of gold and a certain amount of radium. The discover, "a modest youth of 24 years," is very reticent on the subject, and will give no details until he has read a paper before the Alicante Academy of Sciences. In the meantime he is busy selling gold to the jewelers of the city. The inventor's reticence is not surprising.

PERSONALS

Tracy E. Bibbins, president of the Pacific States Electric Company, has been elected president of the Pacific Division of the National Electrical Supply Jobbers' Association. Mr. Bibbins has long been recognized as a helpful factor in the electrical industry throughout the West. Of his many strong characteristics perhaps his willingness and readiness to be always of service in helping to solve problems of the industry and his constant attendance at various meetings devoted to development of the industry as a whole stand out as the most helpful. It is believed that the electrical supply jobbers will prove of constantly increasing helpfulness under Mr. Bibbins' presidency.



R. Q. Cleavenger of the Phoenix Glass Company is planning to spend the month of March on the Pacific Coast.

A. L. Martin, manager of the Marshfield, Ore., division of the Mountain States Power Company, has been elected president of the Marshfield Chamber of Commerce.

E. E. Nash, treasurer of the Peerless Lamp Company of Warren, Ohio, is a recent Pacific Coast visitor and attended the recent Pacific Coast jobbers' gathering at Del Monte.

Henry N. Teague, associate director, division of public works and construction development bureau, Department of Labor, has been in San Francisco recently in connection with his work.

E. E. Berg, who has been with the Hecla Mining Company at Burke, Idaho, for the past year, and with the Washington Water Power Company previous to that time, is now located with the Pacific Power and Light Company at Pasco, Washington.

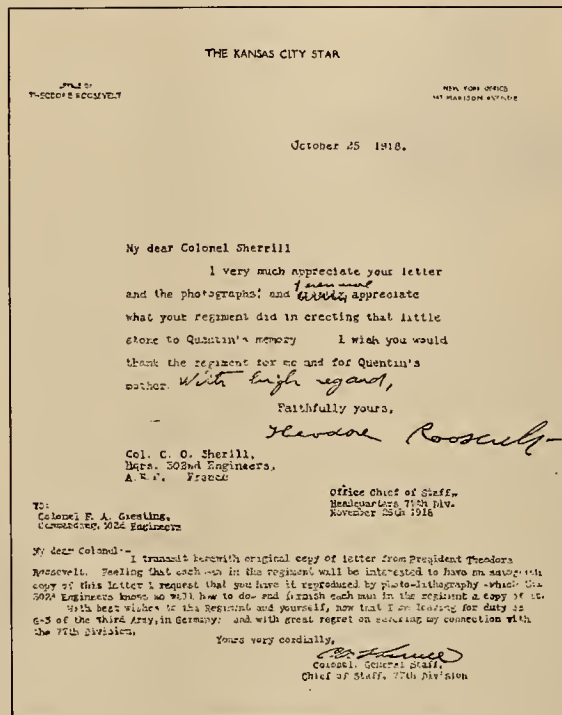
L. R. Jorgensen, a consulting engineer of San Francisco, Cal., and John B. Fisk, chief engineer of the Washington Water Power Company of Spokane, Wash., have been nominated for vice-presidents of the American Institute of Electrical Engineers.

Lieutenant-Colonel J. G. Scrugham, formerly dean of mechanical engineering at the University of Nevada, has closed his work in the Ordnance Department at Washington and returned to Reno. He expects to take a well earned rest for a short time before starting any new activities.

K. C. Yih, Vice-Minister of Communications, Dr. C. C. Wong, Associate Minister of Communications, and J. K. Ham, representing industrial interests, together with several other prominent Chinese, have arrived in San Francisco and are desirous of getting in touch with railroad matters on this coast.

Capt. C. E. Grunsky, Jr., familiar to readers of the Journal of Electricity as the author of one or two of the valuation articles in the series furnished by his father, C. E. Grunsky, Sr., and more recently captain with the 115th Engineers in France, has been given a special commission in charge of the Mining Department in the Finance and Economics Section of the Engineer Department of the American Peace Commission. His work includes the valuation of all the intangible losses at the mines due to the war.

Colonel Frank A. Giesting, a graduate of the University of California with the class of 1906, who prior to the outbreak of the war was on the engineering staff of the Knoxville Power Company with headquarters at Alcoa, Tenn., was in command of the 302nd Engineers in France when the grave of Quentin Roosevelt was discovered. Theodore Roosevelt, his father, appreciatingly acknowledged this service in an interesting letter, a facsimile of which is given below:



A. J. McConnell, president of the Cordova Power Company, Cordova, Alaska, was in Seattle some days ago en route to New York.

W. R. Putnam, formerly sales manager of the Utah Power & Light Company, has been promoted to the position of assistant general manager. H. M. Ferguson, formerly with the Missoula Light & Power Company of Missoula, Montana, succeeds Mr. Putnam in his former activities.

H. H. Jones, general manager of the San Diego Consolidated Gas & Electric Company, is back again at his desk in San Diego after undergoing an operation at the hospital. Mr. Jones is general chairman of the convention committee for the Coronado convention of the Pacific Coast Section, N. E. L. A., and from rumors that persist in coming up from the southern district of the state he is planning to eclipse all previous records.

Henry Bostwick, manager of the San Francisco district of the Pacific Gas & Electric Company, has been elected president of the San Francisco Electrical Development League.

Mr. Bostwick has in recent months been an active factor in much of the helpful war work undertaken by the Rotary Club of San Francisco. His work among the wounded soldiers at the Letterman Hospital has proven especially effective. Much is in store for the San Francisco League in coming months due to the splendid shape in which its affairs stand today



and the plans ahead which Mr. Bostwick is already formulating.

H. H. Bliss, in charge of technical instruction for the Extension Division of the University of California, has just completed a helpful course for study by correspondence designed to be of assistance to any one engaged in the electrical industry who desires to get a clearer grasp of the fundamental laws of electricity. In previous years this course has proved of wide interest, something like a thousand men of the electrical industry having registered for the course. The course has now been rewritten to embody new ideas and



features of instruction not attempted in this course before. It particularly flavors of illustration and practical problems met with in the West where electricity is used to a degree not elsewhere attained. This helpful work is receiving encouragement from many quarters. Central station managers, manufacturers, jobbers, contractor-dealers, are advising their employes to take it. The Advisory Committee of the California Electrical Campaign has declared its willingness to be of every possible assistance. The Journal of Electricity is devoting its columns to help spread the news. This is an opportunity for all believers in increasing efficiency by further study to say a good word for this course.

Dr. Frederick G. Cottrell, a graduate and former professor of the University of California, has been presented with the Perkin medal, one of the highest awards for work in the field of applied chemistry, which is annually conferred by the affiliated chemical and electro-chemical societies of America. The award of the Perkin medal to Dr. Cottrell was made in recognition of his pioneer work in the field of electrical precipitation. The process which Dr. Cottrell invented and first put into operation at the plant of the Hercules Powder Company at Pinole, California, is responsible for saving many millions of dollars' worth of smelter and mine products, which would otherwise have been lost.

Calvin A. Rice, secretary of the American Society of Mechanical Engineers with headquarters in New York City, will make a visit to all important western engineering centers during March and April. With the return of normal conditions in industry comes the opportunity to resume the interest and work in the national engineering societies and men of the West will welcome his helpful presence among us. His itinerary as tentatively planned is as follows: Houston, Tex., March 5, Los Angeles, Cal., March 11-14, San Francisco,



Cal., March 16-22, Portland, Ore., March 25, Seattle, Wash., March 27, Spokane, Wash., March 31, Butte, Mont., April 3, Salt Lake City, Utah, April 7, Denver, Colo., April 10, and Omaha, Neb., April 14.

OBITUARY

E. H. Jacobs, construction engineer and superintendent of all distribution lines of the Western States Gas & Electric Company at Stockton, California, died of pneumonia on January 16th, after having been ill with influenza for about ten days. Mr. Jacobs had been connected with the Western States Company for ten years, and for the last seven years had been located at Stockton.

Major C. S. Noble, Spanish-American war veteran and for several years engineer for the Oregon state highway commission, died of pneumonia at Tours, France, according to a cable message recently received. Major Noble was engineer for Oregon City for a number of years. Then, practically at the time of the formation of the state highway commission, he was offered a position as an engineer with that body. He continued in this capacity until last fall, when he resigned in order to go to France for the Y. M. C. A. as consulting engineer.

The electrical fraternity has suffered a deep bereavement in the passing of W. L. McKinley. A man of genial personality and kindly ways, Mr. McKinley made a host of friends throughout the state who will feel keenly his loss. His whole life was given to the electrical industry and for the past twenty-five years he has been identified with this work on the Pacific Coast, where, in the early days, he was one of the pioneers in the installation and construction of electrical distribution systems. "Bill" McKinley, as he was intimately known by his many friends, was born about twenty miles southeast of LaGrange, Troop county, Georgia. His early education was received at a little log cabin school in the neighborhood and he later graduated from the grammar



and high schools of Chattanooga, Tennessee. In 1889 he entered the employ of the old Thompson-Houston works prior to its consolidation with the Edison Company, from which position he went two years later to assist in the construction of the electric street railway system in St. Louis, and in the construction of the municipal street lighting system in the same city. He was also identified with the World's Fair at Chicago, where he was responsible for some of the fine electrical effects which were developed at that exposition. He first came to the Pacific Coast in 1894 to assist in the electrical features of the Mid-Winter Fair in San Francisco. It was here that he became associated with Jerry Dunn, and after the Fair formed a partnership with Messrs. Dunn and Peterson to engage in the business of electrical contracting. Their first work was the installation for the Pacific Power Company of the first underground electric system in San Francisco. In 1895 they installed the first electric transmission and distribution system in the mining district in the vicinity of Nevada City and Grass Valley, where they built the power line from the Yuba Power House to Nevada City, and constructed the distribution system in these towns for the Nevada County Power Company, the nucleus of the great system of the Pacific Gas & Electric Company. In 1896-97 Mr. McKinley built the system in Vallejo to distribute electric energy from one of the first steam plants installed by Chas. C. Moore and Company. In 1897 he went to Tuolumne county and built the electric distribution system among the mines there for the Tuolumne County Electric Light and Power Company. He was general manager for that company for ten years until it was purchased by the Sierra and San Francisco Power Company, since which time he was continuously associated with Capt. H. F. Jackson in the management and operation of this property up to the time of his death in his home in San Francisco, on February 19th, 1919. His loss will be keenly felt by the Sierra and San Francisco Power Company. Mr. McKinley leaves two children—Walter, who is a wireless operator on the U. S. S. Martha Washington, and Eunice, his charming daughter with whom many electrical men have become acquainted through her attendance at the convention of the National Electric Light Association at Del Monte last year.

MEETING NOTICES FOR ELECTRICAL MEN

(Enthusiasm for the Coronado N. E. L. A. convention is growing with the coming of the spring weather. There have been many local meetings of great interest in the last two weeks period, with special activity reported from the Northwest. Arc welding proves a timely topic at Section meetings throughout the West.—The Editor.)

Joint Meeting — Spokane

The regular meeting of the Spokane Section, A. I. E. E., was held on February 21, 1919, at the Chamber of Commerce Assembly Room as a joint session with the A. S. M. E., A. S. C. E. and the Spokane Engineering & Technical Association.

Dr. C. E. Magnusson, Professor of Electrical Engineering at the University of Washington, presented "A Plan for the Development of Our National Electric Power Resources," the details of which are to be found in the issue of the Journal of Electricity for Nov. 15, 1918. In brief, the plan proposes the application of the principle of the Reclamation Service to electric power development, the government to build main power lines from which the current is bought at wholesale by private companies. The plan brought out most interesting discussion. It was pointed out that government ownership was at present unnecessary, more expensive and less effective. The plan, it was claimed, was ahead of the times because private companies are successfully interconnecting wherever conditions warrant. The leaders in the discussion were J. B. Fisk, Professor Magnusson, Ludwig Kemper and G. E. Quinan, and John Harisberger of Seattle. Paul Lincoln was announced as the speaker for the next meeting. The attendance was about fifty.

Oregon Society of Engineers

The Oregon Society of Engineers at a recent meeting elected officers for the coming year, as follows: J. W. Cunningham, president, O. Laurenguard, vice-president, O. E. Stanley, secretary, H. M. Morris, treasurer; P. H. Dater, A. A. Kratz and H. Munn, directors.

Denver Section, A. I. E. E.

Electric welding was discussed by the Denver section, A. I. E. E., at the Feb. 15th meeting. G. N. Robinson of the General Electric Company surveyed the present situation. As he showed, the efficacy with which this art has been used in shipbuilding and other war industries indicates that its use will be greatly extended in industry in peace times. Various lantern slides showed the applications of the art.

Los Angeles Jovian Electric League

The Wednesday meeting of the Los Angeles Jovian Electric League of Feb. 19, 1919, was held at Hotel Clark, which is to be the regular meeting place from now on. "Teddy" Tetzlaff was the feature of the occasion, speaking on the "Thrills and Spills in the Racing Game." Senator Geo. W. Cartwright spoke on the "Labor Situation" and

offered constructive suggestions as to the handling of the present trend toward Bolshevism.

Of course, there was varied entertainment on the side.

Seattle Section, A. I. E. E.

"The present day uses of the X-ray" was the subject of the Feb. 18th meeting of the Seattle Section, A. I. E. E. C. R. Wallis of the General Electric Company was the speaker of the occasion and pointed out the use of the X-ray in the detection of flaws in construction materials, such as castings, built up mica insulation, etc., as well as the many surgical uses. The talk was well illustrated with lantern slides.

American Welding Society Endorsed

A new organization of those interested in welding has been formed under the title of the American Welding Society. The objects of the society are given as follows:

A—To advance the science and art of welding.

B—To afford its members opportunities for the interchange of ideas with respect to the science and art of welding, and for the publication of information thereon.

C—To conduct research into the science and art of welding, cooperating with other societies, associations and government departments for the benefit of the industry in general.

D—To acquire and dispose of property for the purposes aforesaid. (This clause to be dependent upon its legal aspect.)

E—To do all other things incidental or conducive to the attainment of the above named objects, or any of them.

The membership of the society is to be made up of individuals, organizations or government departments who are interested in the problems of welding. Among those asked to send representatives to the meeting for the purpose of organization were the U. S. Shipping

Board, A. S. M. E., A. S. C. E., A. I. E. E., Bureau of Standards, the War and Navy Departments and many others.

At a meeting of the San Francisco Section, A. S. M. E., which was devoted to the subject of Electric Arc Welding, the following telegram of encouragement was sent with the unanimous endorsement of the meeting:

Mr. Comfort A. Adams,
12 Farrar St.,
Cambridge, Mass.

At a meeting of the San Francisco Section of American Society Mechanical Engineers held at the Engineers' Club San Francisco February thirteenth to discuss the subject of Electric Arc Welding it was unanimously

Resolved, That it be the sense of this meeting that its chairman be requested to send a telegram of greeting to Prof. Comfort A. Adams expressing the interest of engineers of this district in matters pertaining to welding and that Prof. Adams be requested to convey the felicitations of this meeting to the officers and members of the newly organized American Welding Society.

E. C. JONES.

San Francisco Electrical Development League

John D. Galloway was the speaker of the day at the Feb. 17th luncheon of the San Francisco Electrical Develop-

BUILDERS OF THE WEST—XLVIII



FREDERICK G. COTTRELL

To Dr. Frederick G. Cottrell, chief metallurgist of the U. S. Bureau of Mines, inventor of the famous Cottrell electrical system of handling obnoxious particles in chimney gases, and more recently inventor of a new method of producing helium and oxygen that will revolutionize certain industrial activities of the nation, this issue of the Journal of Electricity is affectionately dedicated. The splendid type of broad building exhibited by Dr. Cottrell as a product of our great West is indeed a source of inspiration and enthusiasm to all beholders.

ment League and gave a most interesting account of the share taken by some of the western engineers in the war.

The Feb. 24th meeting was a joint meeting between the league and the Business and Professional Women's Club of San Francisco. Miss Lillian Palmer spoke on what the Business Women's Club can do for the electrical industry, Mrs. Lillian Sherwood told of how to make the most of the office force, and Miss Mae B. Wilkins encouraged the further development of California's resources.

The Pacific Division, Electrical Supply Jobbers

The recent meeting of the Electrical Supply Jobbers' Association at Del Monte, Feb. 13, 14 and 15, will go down in the records as one of the most successful in history. The Saturday meeting, devoted to a discussion of problems confronting the industry as a whole, was unusually helpful. The meeting was opened under the auspices of the manufacturers, with R. M. Alvord of the General Electric Company in the chair. W. M. Deming, general manager of the Technical Publishing Company, publishers of the Journal of Electricity, gave a comprehensive survey of the present status in the electric trade. Numerous telegrams and letters were read from large and small manufacturers which gave very interesting and instructive data on the great problems of the hour. The data will be published in full in the Salesman's Issue of the Journal of Electricity which will appear March 15, 1919. The keynote sounded throughout in these remarkable letters is that the United States is today in position to enjoy the greatest era of prosperity in its history and that pessimism is today as dangerous as the pacifists' utterances during the war period.

R. M. Alvord, in the absence of A. E. Wishon, assistant general manager of the San Joaquin Light & Power Corporation, who was to have delivered a paper, then brought out the salient features of the present work of the California Electrical Cooperative Campaign. Tersely put they are these:

1. That we as members of the industry should consider our vocation worthy to serve society.
2. Exchange of service, goods and ideas is ethical, provided all parties are bettered, including the public and the consumer.
3. To improve ourselves, increase efficiency and serve better.

Garnett Young, president of Garnett Young & Company, presented an interesting paper entitled "The Pacific Coast a Market for Pacific Coast People."

In the discussion which followed these papers A. M. Irwin, of the Westinghouse Electric & Manufacturing Company, emphasized the necessity of reduction in costs of accounting and the advisability of getting the electrical trade on a cash basis.

W. S. Berry, sales manager of the Western Electric Company, pointed out the probable status of the trade in the years ahead would follow somewhat the period after the Civil War, from 1865 to 1880, in which prices declined somewhat, yet labor remained high and still the country at large was very prosperous.

C. C. Hillis, general manager of the Electric Appliance Company, called attention to increased rates in deliveries, amounting to eight per cent, due to the parcel post system and the consequent ban that should be put on the small order business.

L. H. Newbert, chairman of the advisory committee of the California Electrical Cooperative Campaign, emphasized the necessity for the development of the contractor-dealer in order that he may come to a fuller realization of the vast possibilities of the contractor-dealer movement.

Those present at the meeting were as follows:

Alvord, R. M., General Electric Company, San Francisco
Airey, F. J., Pacific States Electric Company, Los Angeles

Anderson, S. B., Pacific States Electric Company, San Francisco
Beck, F. G., National Carbon Company, San Francisco
Behan, R. F., John A. Roebling's Sons Company, San Francisco
Berry, W. S., Western Electric Company, San Francisco
Bibbins, T. E., Pacific States Electric Company, San Francisco
Boring, G. A., Pacific States Electric Company, Portland
Booth, P. M., Edison Electric Appliance Company, Ontario
Butts, D. J., Western Electric Company, San Francisco
Case, J. O., General Electric Company, Los Angeles
Colwell, J. L., Western Electric Company, Seattle
Davis, R. J., Century Electric Company, San Francisco
Deming, W. M. (and wife), Journal of Electricity, San Francisco
Elliot, A. H., Sec'y Electrical Supply Jobbers' Ass'n, San Francisco
England, H. I., Gilson Electrical Supply Company, Oakland
Fagan, F. D. (and wife), Edison Lamp Company, San Francisco
Francis, Ira (and wife), John A. Roebling's Sons Company, San Francisco
Gifford, C. M., H. W. McCandless & Company, San Francisco
Gregory, S. B., Arrow Electric Company, San Francisco
Gray, G. A., Manufacturer's Agent, San Francisco
Gerhardt, F. A., Crouse-Hinds Company, San Francisco
Green, W. H., Chicago Fuse Manufacturing Company, San Francisco
Holabird, R. D., Holabird Electric Company, San Francisco
Holabird, H. G., Holabird Electric Company, Los Angeles
Hotterman, R. J., Holabird Electric Company, San Francisco
Heise, Carl (and wife), Westinghouse Electric & Mfg. Co., San Francisco
Hall, C. B., Illinois Electric Company, Los Angeles
Harper, H. L., Western Electric Company, Los Angeles
Harris, D. E., Pacific States Electric Company, San Francisco
Hillis, C. C., Electric Appliance Company, San Francisco
Hawley, C. B., Intermountain Electric Company, Salt Lake City
Harris, M. M., Baker-Pacific Hardware & Steel, San Francisco
Holberton, G. C., formerly Pacific Gas & Electric Co., San Francisco
Irwin, A. M. (and wife), Westinghouse Electric & Mfg. Co., Los Angeles
Merrill, W. W., Chicago Fuse Manufacturing Company, Chicago.
Murphy, F. S., guest of C. B. Hawley
Noack, Harry, Pacific States Electric Company, San Francisco
Nash, E. E., Peerless Lamp Company, Warren, Ohio
Oman, G. L., Pacific States Electric Company, Portland
Oakes, R. F., National Carbon Company, San Francisco
Quick, Paul, Landers, Frary & Clark, San Francisco
Pomeroy, J. G., Manufacturer's Agent, Los Angeles
Painter, J. V., Appleton Electric Company, Chicago
Petersen, S. W., Stubbs Electric Company, Portland
Sweet, Leon (guest of C. B. Hawley), Salt Lake City
Sanderson, H. E., Bryant Electric Company, San Francisco
Sawyer, W. B., Jr., United States Steel Products Company, San Francisco
Shreve, E. O., General Electric Company, San Francisco
Sibley, Robert, Journal of Electricity, San Francisco
Steele, M. F., Benjamin Electric Manufacturing Company, San Francisco
Taylor, S. H., Electric Ry. Mfg. & Supply Company, San Francisco
Vandegrift, J. A., National Lamp Works, Oakland
Wallis, E. J. (and wife and friends), Western Electric Company, S. F.
Wiggin, C. E., Dunham, Carrigan & Hayden, San Francisco
Ward, S. G., Western Electric Company, Portland
Will, C. M., Fobes Supply Company, Portland
Young, Garnett (and wife), Garnett Young & Company, San Francisco
Yost, H. F., Trumbull Electric Mfg. Company, San Francisco

The golfing tournament followed by the banquet had unusual thrills. The manufacturer's cup was won by W. B. Sawyer of the United States Steel Products Company while C. B. Hawley of the Intermountain Electric Company of Salt Lake City carried away the famous jobber's cup—the copper trophy now such a splendid tradition in this organization. Harry Holabird of the Holabird Electrical Company, Los Angeles, acted as toastmaster, and in his quiet way succeeded in inducing Ira Francis, H. E. Sanderson, Albert Elliot, C. C. Hillis, and C. B. Hawley to establish new records in the art of oratory that will long linger in the minds of those present. And then there was the singing by Bill Shreve and Frank Fagan, to say nothing of the world record in automobile traffic from San Francisco to Del Monte established by the latter gentleman—all incidents that gave spice and entertainment to this gathering.

British Columbia Electrical Contractors and Dealers

The British Columbia Association of Electrical Contractors and Dealers will hold their convention in the latter part of May, at Vancouver, B. C. Special interest is being taken in the plans for the meetings as Mr. Samuel Chase, of the Westinghouse Company, Pittsburgh, Pa., has already promised to be present. It is also probable that W. L. Goodwin will be here to discuss his plans for national benefit. An effort will be made to notify every electrical man in the province, even up to the Yukon.

Midwinter Convention of A. I. E. E.

The seventh midwinter convention of the A. I. E. E. took place in New York on Feb. 19-21. Among the topics of interest discussed in the technical sessions were those of Electric Welding, Radio Telephony, New Astronomy and other subjects of present day interest. Excursions were made to the Brooklyn Navy Yard and the Bell System Laboratories of the Western Electric Company.



A view of the attractive Coronado Hotel which is to be the scene of the big Victory Convention of the Pacific Coast Section N. E. L. A. on Apr. 30th-May 2d. Plans are already being made for automobile parties from San Francisco and intermediate points, as well as the delegation who are to go down on the train. It is expected that the many eastern visitors will later take in the points of interest about the state.

THE BIG VICTORY CONVENTIONS AT CORONADO

The Coronado convention plans are fast rounding into shape. Men from all quarters of the West and many in eastern centers are planning to make the last week in April and the first week in May a period for interchange of ideas and for getting some comprehension of the vast new business opportunities of the West. To this end the great hotels such as the Coronado and the Del Monte are making forecasts for unusual visits during this period of the year, when California is at her best.

April 30th-May 2d, inclusive, are the dates for the third annual convention of the Pacific Coast Section, National Electric Light Association.

Hotel del Coronado, Coronado Beach, California, is the meeting place. The hotel rate will be \$5.50 per day for room and bath. All meetings will be held in the hotel, which is admirably suited for this purpose.

A large attendance is already assured, not only because of the intense interest of members in the papers and discussion to be presented at this Victory Convention, but also because of the fact that the quarterly meeting of the California Association of Electrical Contractors and Dealers and the Pacific Coast Electrical Supply Jobbers' Association are to be held at the same time and place. The Westinghouse Agent Jobbers' Association will also schedule a special train from Chicago so that its members may attend this meeting prior to their own annual gathering, at Del Monte, May 4-11. This means an additional attendance of 60 or 70 jobbers from all parts of the country.

Papers —

All papers will be printed in the Journal of Electricity of April 15, 1919, a copy of which will be mailed to members in ample time to prepare discussion. No papers will be read at the meeting, so as to allow full opportunity for discussion.

Commercial Committee Program —

A. W. Childs, chairman of the Commercial Committee, has announced a preliminary list of papers subject to possible change. These include the following:

- "The Proper Training of the Sales Personnel," by Lee H. Newbert, I. W. Alexander and J. F. Pollard.
- "The Contractor-Dealers of Tomorrow," by John C. Rendler.
- "The Jobbers' Relation to the Industry," by W. S. Berry.
- "Means for Establishing Closer Relations Between the Architects and the Electrical Industry," by J. O. Case.
- "Interesting the Consumer," by T. W. Simpson.
- "Progress of Electric Cooking and Heating," by B. M. Maddox.
- "Wiring for Heavy Wattage Appliances," by author to be announced later.

Engineering Committee Program —

H. A. Barre, chairman of the Engineering Committee, has arranged for the following papers, to which others will be added subsequently:

- "Protective Relays on Main Transmission Lines," by Geo. E. Armstrong.
- "Some Minor Aspects of Interconnected Systems," by L. M. Klauber.
- "The San Joaquin-Edison Interconnection," by G. R. Kenny.
- "Development of Small Automatic Power Plants," by E. A. Quinn.

Convention Committee —

H. H. Jones, manager of the San Diego Consolidated Gas & Electric Company, will act as chairman of the general convention committee, and Mr. William Clayton, of the United Light, Fuel & Power Company of San Diego, will be vice-chairman. This committee has charge of all convention arrangements and is made up of the chairmen of the various sub-committees, each of whom will appoint his own committee to handle the work.

Chairman Jones has announced the personnel of his sub-committee chairmen as follows:

- Papers—J. B. Black, Great Western Power Company, San Francisco.
- Registration and Hotel—A. E. Holloway, San Diego Consolidated Gas & Electric Company.
- Transportation—W. M. Deming, Journal of Electricity.
- Reception—William Clayton, United Light, Fuel & Power Company, San Diego.
- Entertainment—K. E. Van Kuran, Westinghouse Electric & Manufacturing Company.
- Publicity, Printing and Meeting—A. H. Halloran, Journal of Electricity.
- Outdoor Sports—G. H. P. Dellman, General Electric Company.
- Banquet—T. E. Bibbins, Pacific States Electric Company.
- Ladies' Entertainment—W. L. Frost, Southern California Edison Company.
- Finance—J. F. Pollard, Sierra & San Francisco Power Company.
- Auditing—B. B. Stith, Western States Gas & Electric Company.

Transportation and Hotel Committees —

W. M. Deming, master of transportation, in conjunction with A. E. Holloway, chairman of the Hotel and Registration Committee, will soon send out a circular giving rates and accommodations schedule. The Pacific Steamship Company's "S. S. President" will leave San Francisco, 12 noon, April 28, arrive at Los Angeles, 12 noon, April 29, whence the Santa Fe may be taken to San Diego, arriving there at 6:10 p.m., April 29th, or the steamer may be taken so as to reach there at 4:30 p.m., April 30th. The steamer leaves San Diego, 11 p.m., Sunday, May 4th, and reaches San Francisco Tuesday noon. There is also a possibility that Mr. Deming will prevail upon the Federal Railroad Administration to put special convention rates in effect on the railroads. Many members are planning to drive their automobiles to San Diego.

N. E. L. A. Exhibition Committee Plans for 1919

The Exhibition Committee of the N. E. L. A. held a meeting at the Headquarters on February 15th, under the chairmanship of Mr. J. W. Perry. It was formally decided to approve the proposition to hold the next annual convention at Atlantic City the week of May 19th, and to resume all the proposed plans and activities that had been so carefully worked out in 1917, with additional features of interest to the operating member companies. These will be given in full for publication as soon as possible. In the meantime the exhibition committee is now communicating with all the pledged and prospective exhibitors, upon whom it is impressing the fact that this is the Reconstruction Convention after the Great War, the most notable and historic in the life of the N. E. L. A. Mr. H. G. McConnaughy, secretary of the Exhibition Committee, can be addressed on all such matters at the Association offices; and it is suggested that all exhibitors get in touch with him at once.

Meeting of Portland Electrical Contractors

The regular meeting of the Portland District Association of Electrical Contractors and Dealers was held at the American Cafeteria on Monday evening, Jan. 27, 1919.

Communications from the National Association, B. W. Paul, Massachusetts State Association, Beaver Electric Co. and Pennsylvania State Association, were read, ordered answered and filed, except the letter from Pennsylvania State Association, which was referred to the legislative committee.

Mr. Green, of the legislative committee, reported that

the licensing bill would be introduced in the lower house in a revised form, the committee having deemed it advisable to change same by including therein a provision incorporating the adoption of the Electric Code prepared by the U. S. Bureau of Standards, wherever there was no existing state and municipal ordinance.

The wiring committee, having no report, was asked by the chairman to have a report ready by the next meeting.

Mr. Knight, of the finance committee, reported progress and promised to have a report and recommendations at the next meeting.

Mr. Scott reported having added some new price sheets to the retail price book and that some changes were now in the hands of the printer.

Considerable discussion was had in regard to installing of fire alarm bells and Mr. Jaggar reported that the fire marshal had made a ruling that he would only pass jobs for this work having six-inch bells, break glass boxes, snap lock switches for testing and wire of sufficient strength to make said installation a good job. Upon motion the matter was referred to a committee consisting of S. C. Jaggar, F. C. Green and R. W. Larsen.

Mr. Larsen reported that he had attended the meeting of the Pacific Division at Sacramento, Cal., on January 10 and 11 and what matters were discussed and recommendations made, also of visiting San Francisco and what he noticed among the contractors of California.

There being no further business the meeting adjourned at 9:30 p.m.

HAPPENINGS IN THE INDUSTRY

NEW POWER DEVELOPMENT

A deal has been closed with an Eastern syndicate for underwriting \$7,500,000 of securities of the Great Western Power Company of California, a new corporation, which will take over the properties of the Great Western Power Co. The new securities consist of \$6,000,000 first and refunding 6 per cent bonds of the new Great Western Power Company of California and \$1,500,000 of 7 per cent cumulative preferred stock of the same corporation. The purpose of the initial issue is to build a new power plant on the Feather river at Caribou, a point on the old Caribou trail in that region about nine miles up river from Belden. It will also furnish sufficient money for the construction of a new power transmission line to San Francisco bay of 150,000 volts.

The new plant, which is the first one of any size to be built in California for a number of years, will be one of the largest in the United States, having a capacity of 120,000 kilowatts in continuous output. Present plans provide for the development of one-third of this potential capacity, or 40,000 kilowatts. The transmission line will be 192 miles in length.

INCOME TAX DUE

Work on the collection of \$6,000,000,000 has been begun by the Bureau of Internal Revenue. This is the estimated yield of the new revenue bill. The income tax provisions of the act reach the pocket-book of every single person in the United States whose net income for 1918 was \$1000 or more, and of every married person whose net income was \$2,000 or more. Persons whose net income equaled or exceeded these amounts, according to their marital status, must file a return of income with the collector of internal revenue for the district in which they live on or before March 15. The normal rate of tax under the new act is 6 per cent of the first \$4,000 of net income above the exemptions, and 12 per cent of the net income in excess of \$4,000. Incomes in excess of \$5,000 are subject also to a surtax ranging from 1 per

cent of the amount of the net income between \$5,000 and \$6,000 to 65 per cent of the net income above \$1,000,000.

COURSE FOR COMPANY EMPLOYEES

Business men of industrial concerns in the San Francisco Bay region may organize through the University of California Extension, special courses to meet the peculiar needs of their employees. Any concern having fifteen or twenty men in need of special training may apply by mail to Professor Richardson at 301 California Hall, Berkeley, for the organization of a special class limited to the employees of that concern. Courses available cover a wide range of subjects, including special instruction in Spanish, Russian, trade conditions, banking relations, etc., for employees of commercial houses; construction in automobile care and repair; civil engineering, electrical engineering, shop work, business English, shorthand and typewriting, accounting, and numerous other allied subjects. Application for these special courses may also be made at the San Francisco Chamber of Commerce.

PROPOSED CHANGE IN CALIFORNIA STATE INSURANCE

The California Industrial Accident Commission is opposing the passage of Senate Bill No. 603 and Assembly Bill No. 791. These bills propose to take the State Compensation Insurance Fund from the management of the Commission and place it under the jurisdiction of other state officials.

There are excellent reasons why the Industrial Accident Commission should continue to direct the State Compensation Insurance Fund. Ever since January 1, 1914, the fund has been under the actual management of expert insurance men, selected for their positions because of their ability. The outcome is a well-managed fund, recognized as the most successful institution of its kind in the United States.

More than \$790,000 has been returned in dividends to policy holders, thus affording a striking example of mutual

insurance under state auspices. The overhead expenses of the fund are less than 13 per cent of premiums, as against 40 per cent for stock companies. The net surplus on January 1, 1919, was over \$1,000,000. Over \$2,000,000 of assets is invested in United States Liberty Bonds and California municipal bonds, drawing interest for the benefit of the policy holders. California's employers have been saved an average of over 34 per cent of compensation insurance cost for the years 1914 and 1915 (for which the reserve period has expired), and an initial refund averaging 15 per cent is returned to policy holders at the end of each year.

POLISH COMMERCIAL BUREAU

A Commercial and Industrial Bureau of the Polish National Department has been formed, with the object to help in starting commercial relations between the United States and Poland, and to collect all data and information which should form a basis for the work of the future official Polish commercial agencies in this country, and facilitate mutual economic relations.

THE PROGRAM OF POWER DEVELOPMENT

A Letter to the Editor

(What is being done and what should be done in the matter of pushing power development in the West is here pointed out in a letter from Major Sever of the War Industries Board, who thanks the Journal of Electricity for its services in furthering this great end.—The Editor.)

Editor, Journal of Electricity:

I certainly appreciate your efforts to further the hydroelectric development on the Coast and also your viewpoint as to the desirability of these developments for meeting the industrial growth of the Coast and also to replace the use of fuel oil and thus carry out the idea of conservation of natural resources. The assistance which you gave me in many ways is deeply appreciated and I trust the joint efforts of all will result in securing a largely increased electric power supply for California. Imagine, if you will, what will happen to California when it is not able to secure power from oil or expensive coal and does not have sufficient hydroelectric capacity to meet all the industrial needs of the state. California has to depend absolutely upon the further development of hydroelectric power and at a rapidly accelerated rate, for judging from the most reliable reports the oil supply is not going to be of long duration and nothing else will replace it economically except the extensive development on the correct basis of hydroelectric energy. The latter will last for all time, judging from past meteorological records. This thought should be set forth over and over again in order that some action can be secured. It is hoped by some that the Conference Committee on the Administration Water Power Bill will take some action during this Congress and some result will be secured. I sincerely hope that something will develop in order to remove this doubt from the minds of those who desire to carry out the hydroelectric projects that are necessary for the life of California.

Incidentally, the companies of California have a program up and down the state which calls for an expenditure during the next five years of over \$80,000,000.

Anything you can do, and I am sure you will do everything, to push this matter along, will undoubtedly be appreciated by the inhabitants of California.

GEO. F. SEVER.

TRADE NOTES

Reorganization of Company —

The Pulverized Fuel Equipment Corporation has recently been organized for the purpose of taking over the business of the Locomotive Pulverized Fuel Company, and to broaden the activities of the latter to cover the central power station, metallurgical and industrial fields. The head

offices are at 30 Church street, New York City, with Canadian office in the Transportation Building, Montreal. This corporation installs and delivers in operation complete plants of its "Lopulco" system for the preparation, distribution, storage, feeding and burning of pulverized fuel for steam generating or heating purposes.

Fixation of Nitrogen —

The American Nitrogen Products Company, Ltd., is constructing a battery of furnaces for the fixation of nitrogen from the air, by the use of surplus power from the system of the British Columbia Electric Company. The furnaces will be located near the Lake Buntzen No. 1 Plant, and will be supplied from this source.

Change of Location —

Announcement is made of the removal of the New York sales office of the Edison Storage Battery Company from 209 West 76th street, to 247-251 West 35th street, New York City.

New Address —

After January 1, 1919, the address of the executive offices of the Associated Advertising Clubs of the World was changed to 110 W. 40th street, New York City.

New York Office —

The Square D Company, Detroit, manufacturers of Square D Switches, opened a new metropolitan office at 149 Broadway, New York, on Jan. 1. J. A. Jaques, district sales manager, has been placed in charge of the office.

Chicago Appointment —

The Roller-Smith Company, 233 Broadway, New York City, announces the appointment of Mr. Frank H. Ryan to the sales force of its Chicago office located at 740 Monadnock Block.

Enlarged Scope —

A. L. Myers & Company of San Francisco is planning to materially enlarge the scope of its business activities. Mr. Wm. M. Schwartz, who has just been mustered out after a year or more in government service, will in future be associated with Mr. Myers. Larger quarters are being secured in order to provide suitable facilities for the enlarged business.

Electric Furnace in Use —

The Ludthorpe Electric Metals Co., Ltd., is constructing a plant and establishing a 1500 kw. 3-phase furnace in Vancouver, B. C. The firm has arranged to secure all the cast-off metals of the C. P. R. shops, and will also work on an accumulation of metal borings and similar scrap that can be successfully handled by such modern methods.

Company Meeting —

The second annual convention of Oregon representatives and dealers of Delco-light was held recently at the Multnomah Hotel, Portland. E. G. Byrne, salesman-engineer of the Delco-Light factory at Dayton, Ohio, who is on his way to the Orient in the interests of the company, was the principal speaker at the conference. E. H. Epperson of Seattle, western sales manager, was another speaker, and a general business discussion was held.

Personal Items —

W. H. Green has been appointed Pacific Coast manager of the Chicago Fuse Manufacturing Company with headquarters in San Francisco.

G. B. Kirker, railway engineer from Los Angeles, and A. W. Eshelby, railway engineer from Seattle, both of the Westinghouse Electric & Manufacturing Company, have been recent visitors in San Francisco.

W. W. Flanders, formerly manager of the Puget Sound Gas Company at Everett, Wash., has been appointed general superintendent of the Tacoma Gas & Fuel Company.

Curtis M. Lindsay, whose promotion to the position of manager of advertising and sales promotion of the Edison



Electric Appliance Company, Inc., has recently been announced, and Walter M. Fagan, the newly appointed sales manager of the Hotpoint Division of the company, are both well known on this coast and their appointment is of unusual interest to the electrical industry in the West. Mr. Lindsay is a graduate of the electrical engineering department of Armour Institute, class of 1909. After a period of engineering field work

with the J. G. White Company, he joined the forces of the Hotpoint Electric Heating Company, Ontario, California, in 1912, becoming connected with the sales promotion department. Two years ago he came to Chicago as assistant to the Eastern sales manager of the Hotpoint Company and for the past year has been sales manager of the Hotpoint Division of the Edison Electric Appliance Company. Mr. Lindsay has been identified with the Hotpoint sales and advertising campaigns since he started with that company, and his experience makes him especially fitted or his work. Mr. Fagan, a native of California, is nationally known in the electric range field, through his energetic work as sales manager of the Hughes Electric Heating Company and in a similar capacity with the Hughes Division of the Edison Electric Appliance Company, Inc. He has an exceptional grasp of the sale of electric heating appliances, electric ranges, and the utilization of electrical energy for heating and cooking purposes.



C. R. Dederick, representing the Square D Company, Detroit, and making headquarters at Portland, spent the week of February 17th in Seattle.

A. A. Miller, manager of the railway and power department, Westinghouse Electric & Manufacturing Company, Seattle, made a business trip to Spokane recently.

W. D. B. Alexander, president of the Adams Bagnall Electric Company and of the National Screw and Tack Company of Cleveland, Ohio, is in California for about six weeks' stay.

G. A. Richardson, general superintendent of railway, Puget Sound Traction Light & Power Company, Seattle, has gone to New York to make a report for the Brooklyn Rapid Transit Company.

E. J. McIlraith, superintendent of way and structures, Puget Sound Traction Light & Power Company, is in Chicago working with Stone & Webster on the appraisal of the Chicago surface lines.

John V. Painter, general manager of the Appleton Electric Company of Chicago, who has been visiting the Pacific Coast trade during the past month, has returned East via Salt Lake City.

J. G. Bourus, formerly manager of the Olympia Gas Company at Olympia, Wash., has been appointed manager of the Puget Sound Gas Company at Everett, Wash., succeeding W. W. Flanders.

Harry W. Dryden, of the General Electric Company from Schenectady, has been a recent San Francisco visitor.

Elmer Dover, formerly manager of the Byllesby interests in the far Northwest, has resigned and has gone into business for himself.

W. G. Lord, formerly chief electrician of the Arkansas Valley Railway Light & Power Company, Pueblo, Colo., has been appointed superintendent of the Pueblo division, succeeding C. A. Orr, resigned.

Maj. Ainslee A. Gray, who has recently received his discharge from the army, has opened offices in Chicago under the firm name of A. A. Gray & Company, to handle advertising in trade, technical and national papers.

A. W. Eshelby of the railway department, Westinghouse Electric & Manufacturing Company, Seattle, has returned from a two weeks' trip to San Francisco, where he was in conference with Westinghouse railway men.

F. W. Rust, formerly with the Rainier Electric Company of Seattle, has opened offices in the Seattle National Bank Building and is prepared to do electrical contracting. The new firm is known as F. W. Rust and Company.

P. S. Turner, manager traction department, British Westinghouse Company, and Mr. Raworth, electrical engineer with the Southeastern & Chatham Railway in England, were in Seattle recently for the purpose of inspecting steam railroad electrifications.

C. A. Winder, in charge of industrial heating for the General Electric Company with headquarters at Schenectady, N. Y., is a recent Pacific Coast visitor. Mr. Winder speaks most enthusiastically of the tremendous possibilities of this growing industry throughout the West.

Oliver Dowdell, of the Solano Supply & Construction Company, Suisun, Cal., is making some extensive improvements in his place of business, taking the building next door. His present room will be devoted to the sale of household appliances and the new one to his Willard service station.

B. A. Wagner, manager Electric Agencies Company, Inc., has returned to San Francisco from a trip East. As new representation secured for his company on the Pacific Coast he reports the Collyer Insulated Wire Company, manufacturers of rubber covered and weatherproof wire, and the Tubular Woven Fabric Company, manufacturers of "Dura-duct."

D. J. Butts, formerly local manager of the Los Angeles branch of the Western Electric Company, has been transferred to headquarters in San Francisco and will in future have charge of certain specialties in the entire Pacific Coast district. Mr. Butts is succeeded in Los Angeles by H. L. Harper, who was formerly sales manager of the Kansas City branch of the Western Electric Company.

R. F. Behan, formerly chief assistant to the Pacific Coast manager of the Westinghouse Electric & Manufacturing Company, is now with John A. Roebling's Sons Company with headquarters in San Francisco. Mr. Behan has a wide acquaintanceship among men of the electrical industry throughout the West and he carries with him a host of good wishes in his new field of endeavor.

Captain J. H. Moseley, formerly on the advertising staff of the Journal of Electricity and later with the Texas Power & Light Company, has been appointed assistant to Mr. P. H. Thompson, advertising manager of the Western Electric Company. Men of the electrical industry in the West will recall the effective work of Mr. Thompson on many occasions looking toward the selling of the electrical idea as a whole, irrespective of selfish company interests, and his appointment of Mr. Moseley, a young man of broad experience and high ideals, is believed to be in full keeping with this progressive policy.

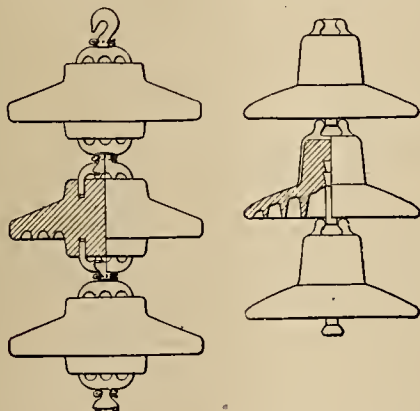
LATEST IN EVERYTHING ELECTRICAL

(A new circuit breaker which meets the needs of the electrified transcontinental railroad, a line of receptacles and plugs especially designed for marine use, a farm lighting and power outfit which is practically automatic, and a new type of high tension insulator which promises to solve many of the weaknesses hitherto thought unavoidable in such supplies are among the new electrical devices here presented.—The Editor.)

HIGH TENSION INSULATORS

The present type of suspension insulator has caused extremely severe trouble, according to a recent article in the *Electrical World*, and despite the many improvements which have been made and suggested it appears that the insulator will retain certain inherent weaknesses. A new insulator of this type has been put on the market, however, which promises to become a serious competitor to the suspension insulator now in use, as it embodies many important features. This is the type of insulator which the Jeffery Dewitt Insulator Company has been developing.

The advantages of this new suspension insulator may be summarized as follows: (1) the disk is of extremely heavy bulk and accordingly should resist power-arc destruction.



(2) The design is such that temperature changes should have very little effect. (3) The iron spider is cast into the porcelain body by means of some low-melting and comparatively soft alloy which should act as a damper of shocks. (4) The electrostatic field is so nearly ideal and the puncture thickness between electrodes so excessive that the unit should be puncture-proof with porcelain of fair quality.

The mechanical strength of the unit is somewhat lower than that which is obtained from the ordinary type of suspension unit, but it offers, on the other hand, the advantage that its guaranteed strength can be verified on each unit before leaving the factory. This cannot be done on the cemented insulator.

Baker-Joslyn Company of Los Angeles, San Francisco and Seattle have been appointed Pacific Coast distributors of these insulators.

SAFETY CARS IN PORTLAND

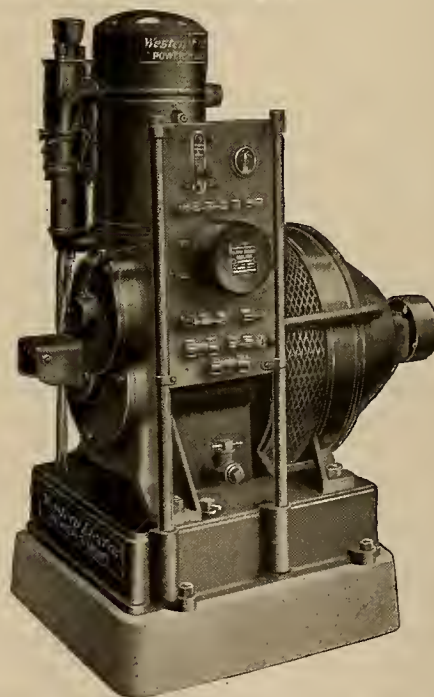
The first of the 25 Birney safety cars have been put into service by the Portland Railway Light & Power Company. It is a light car mounted on a single truck, seats 32 people and is operated by one man. The axles have ball bearings and the power is ample with equipment devices that make it a speedy car in operation, picking up speed more quickly than a heavy car and quickly coming to a stop. The safety features are especially calculated to overcome the objections that are sometimes urged against a one-man operation of street cars. The operator's hand must be on the control or his foot on another control lever to keep the car in operation. When levers are free the brakes are automatically applied,

the motor stops, sand pipes are open and when the car halts the doors are opened. The door control is by air pressure, operated by a device on the control lever of the motor.

FARM LIGHTING AND POWER

The Western Electric Company has gotten out a direct connected farm lighting set which is of all around serviceability and simplicity. The set is practically automatic throughout—as much as any mechanical power outfit can be made. At every point it was designed for the convenience of the user as well as for the service it gives.

The generator of the set is specially designed and the engine operates in such a manner as to give a tapering charge to the battery. This tapering charge allows just the right amount of current to flow in the battery. When the charge is completed the engine is automatically stopped by the little device on the control panel.



In addition to the tapering charge given regularly to the battery an occasional soaking charge is provided for by the battery switch. This combination of tapering charge and periodic soaking charge offers a dual-control of battery charging and is the best method for charging a battery. The dual-control method gives longer life to the battery.

This set is more than an electric light plant. It can be used as an engine alone. The 4 in. pulley on the main shaft may be belted to line shafting or other machinery and run independent of the rest of the plant.

The entire outfit stands about 4½ ft. high and occupies approximately 30 to 40 sq. ft. floor space.

Type and Size	Watt Hour Capacity of Battery, Eight Hour Basis
15-DC-90	2700
15-DC-180	5400

Explanation of code number: The first figure expresses capacity of generator in hundreds of watts. The letter indicates the direct connected set. The last figure expresses the capacity of the battery in ampere hours (8-hour rating). Thus 15-DC-90 means 1500 watt generator, direct connected set and a 90 ampere hour battery, rated on the 8-hour basis.

BRYANT PLUGS AND RECEPTACLES FOR MARINE USE

The receptacles and plugs shown herewith are well known Spartan standard interchangeable type, but properly adapted for marine use where non W. T. extension cord outlets are desired in officers' quarters, mess rooms, cabins and state rooms.

Bryant Spartan interchangeable N. W. T. Marine Plug type receptacles offer a distinct advantage, because of the fact that they fit the plugs which are furnished with every



fan motor, practically all table lamps and other current consuming devices.

The base of this plug receptacle is unbreakable composition, as used on all other Bryant marine devices, the top section is hard white porcelain, glazed. This receptacle, catalogue No. 123, has a bottom diameter of $1\frac{1}{4}$ in., top diameter $1\frac{3}{8}$ in., height $1\frac{13}{16}$ in.; a groove of ample size is provided in the base for wires to pass through or to allow wire entrance from the bottom of the box. Brass fastening screws $\frac{6}{32}$ are furnished and kept in place by holding washers. Screw centers are $1\frac{1}{8}$ in., which is the standard for all Bryant marine devices.

The K. D. cap is intended for use on small flexible cords not over $\frac{13}{32}$ of an inch in diameter. For heavy insulated or metal armored cables up to $\frac{9}{16}$ in. in diameter, the M. K. cap is best suited, as it is provided with a strain relief clamp and cord grip. Both of these caps are made of unbreakable composition and will stand severe usage.

NEW HIGH SPEED CIRCUIT BREAKER

High speed circuit breakers involving unusual characteristics have been developed and placed in operation by the General Electric Company to protect the generating apparatus in the Chicago, Milwaukee & St. Paul substations from flashovers resulting from short circuits near the stations. It is the function of this apparatus to operate with sufficient speed to check the rise in current caused by a short circuit before damage can be done to the converting equipment. In order to meet this requirement, it is necessary that the rise in current be checked within a few thousandths of a second and the circuit breaker described below meets these conditions in every respect. The rate of acceleration on the main and secondary contacts is approximately 8000 ft. per second and they are released in a time as short as .003 second or less from the beginning of a short circuit. The time from the beginning of the rise in current caused by a short circuit until the secondary contacts part, has shown by test to be of the order of .004 second. This compares with about .10 to .15 of a second, the speed of ordinary switchboard type breakers.

It has been the practice on many railroads to install a certain amount of feeder as resistance between the substation and the tapping-in point usually by carrying out the feeders to some distance from the station before tapping in. It was evident, therefore, that if apparatus could be developed to protect the generators from liability of flashover on severe short circuits, it would permit of the feeders being tapped directly to the trolley at the substation, thus eliminating the losses due to feeder resistance.

Preliminary calculations in connection with the electrification of the Chicago, Milwaukee & St. Paul Railway showed that quite an appreciable amount of power could be saved each year by the elimination of this extra feeder resistance. Work was therefore initiated on the development of an air circuit breaker which would have such a high speed in opening that it could be used to insert resistance in the circuit soon enough to prevent the short circuit current from reaching such a value as to cause the direct current machinery to flash over.

One of these breakers is installed in each substation and connected into the negative return circuit between the ground and the negative bus. This location would give the maximum protection since the return circuit must pass through the limiting resistance in case of a flashover from the positive to ground as all of the negative terminals, bus rigging, etc., are insulated for full generator voltage. To insure complete protection the high speed breaker is so interlocked with the regular switchboard type of air circuit breaker that the high speed breaker must always be closed before the switchboard breakers.

The fourteen 3000 volt direct current substations on the Chicago, Milwaukee & St. Paul Railway are equipped with this new type of breaker and the first units installed have been in operation since early in 1917 with very satisfactory results. All substation feeders are tapped to the overhead trolley system directly at the substation, eliminating the resistance losses occasioned by tapping at some distance away. Actual operation has demonstrated that it is entirely practicable to operate direct current stations in this manner when protected by the high speed circuit breaker, even though the voltage of the system (3000 volts) is the highest d.c. voltage used in commercial railway work.

The high speed circuit breaker installed for the Chicago, Milwaukee & St. Paul Railway is of the single pole, magnetic blowout type rated 3600 volts, 3000 amperes, direct current. The breaker and mechanism for a self-contained unit are mounted on a structural iron framework with cast iron base. The base and framework are in turn mounted on an insulated base to insulate the circuit breaker from the station floor. The operating mechanism is so arranged that the breaker can be closed either by hand at the breaker or by a motor controlled from the station switchboard. The closing of the breaker by means of the motor is accomplished by a cam mechanism operated through gears. When closed by hand, a ratchet mechanism is used.

BOOK REVIEW

Public Utility Reports Annotated

Decisions of the Public Service Commissioners and of the State and Federal Courts. Size $6\frac{1}{2}$ by $9\frac{1}{2}$ in.; 1132 pp.; cloth binding. Published by the Lawyer's Co-Operative Publishing Company, Rochester, N. Y., and for sale by the Technical Book Shop, 171-173 Second St., San Francisco. Price \$5.00 per volume.

Many public commissions do not print decisions currently and they are not conveniently available until the annual or biennial reports are issued. For the convenience of public utility men and those associated in the industry, the reports of all cases coming before the public service commissions of the country and of the state and federal courts have been issued currently in pamphlet form by the Lawyer's Co-Operative Publishing Company and later gathered in volume form for convenient reference use, six volumes to a year. All important cases which record the growth and development of the public utility laws are given in full. Cases of less importance are abstracted and all are supplemented by annotations covering decisions prior to 1915. The value of the books is greatly enhanced by the careful analysis and indexing of all information in each decision. The reports constitute perhaps the most important source of information available to engineers and utility lawyers.

NEW ELECTRICAL DEVELOPMENTS

(An underground system is suggested for Vancouver, B. C., the use of power for irrigation projects is being greatly extended in the Pacific Central region, the Southern California Edison Company contemplates extensions in the Kern country—and the western tendency toward an engineers' licensing law has extended to Nevada.—The Editor.)

THE PACIFIC NORTHWEST

CENTRALIA, WASH.—The total receipts from the municipal light plant for 1918 show that the revenues were \$35,595.13. Expenditures totaled \$30,233.88.

PROSSER, WASH.—Pacific Power & Light Company has plans under way which include rebuilding practically its entire system here before fall. The Benton Independent Telephone Company will also rebuild its down town system.

VANCOUVER, B. C.—In the annual report of the minister of public works, the suggestion is made that the matter of an underground system of transmission lines in the city, which has been held in abeyance until the end of the war, be reopened for consideration.

SEATTLE, WASH.—Appropriations aggregating \$55,000 to finance preliminary investigations as to the feasibility of the Skagit river power project, bringing the total expenditures for this purpose to date to approximately \$135,000, have been authorized by the city council.

SEATTLE, WASH.—No bids were received by the city for the purchase of \$750,000 municipal light and power bonds. These bonds are the first of an issue of \$1,755,000 authorized by the council November 18, 1918, for extensions and betterments to the city's lighting plant.

EVERETT, WASH.—This place is to be given a chance in the near future to vote on the question of establishing a municipal light and power plant. The city commission has been quietly planning for several months for the development of power on the Sultan river, the first unit to call for 6,000 horsepower.

OLYMPIA, WASH.—Acting Governor Hart has approved of Senate Bill No. 18, the act under which the public service commission is authorized to exceed the five cent limit on street car fare within city limits. City councils are given the same authority over municipally-owned lines. The bill carries an emergency clause.

SEATTLE, WASH.—That there is a deficit of \$73,082.60 in the funds appropriated for the construction of the municipal elevated street railway from First avenue South and Washington street to West Spokane street bridge over the West Waterway, was reported to the city council recently by A. H. Dimock, city engineer.

OLYMPIA, WASH.—Sealed bids will be received up to 5 o'clock p.m. March 4, 1919, by Hiram Dohm, city clerk, for furnishing the city with an electrically-driven centrifugal pumping unit, said unit to deliver not less than 800 gallons per minute of water against a 225-foot head, motor to be a 440 volt, 60 cycle, three phase.

OLYMPIA, WASH.—In the report of the hydraulic engineer recently presented, a recommendation for the further development of Washington's power resources is made. At present, the report says, only 257,415 kilowatts of power are being developed, while the state has potential power sites that will develop more than 5,000,000 horsepower.

SEATTLE, WASH.—Mayor Hanson and President A. W. Leonard have signed the contract for purchase by the city of the lines of the Puget Sound Traction Light & Power Company, also the contract by which the city agrees to purchase power from the traction company until such time as the city is able to supply its own power. The city will not come into possession of the property until the Supreme Court passes on the question of the legality of the transfer.

SPOKANE, WASH.—Announcement has been made of the purchase by the Washington Water Power Company of the Spokane Heat, Light & Power Company for a consideration reported to be \$1,500,000. The Spokane Heat, Light & Power Company is in the hands of a receiver and consummation of the details of the sale must come through the federal court.

KLAMATH FALLS, ORE.—Consulting Engineer D. C. Henny and George W. Oldfield, president of the Water Users' Association, have made an appraisal of the Ankenny canal and power site from the upper lake to the Leavitt place, the purpose being to submit to the Secretary of the Interior a figure at which this property can be disposed of to anyone who may desire to purchase.

ASTORIA, ORE.—This place has been practically assured of a new light and power plant to take care of the industrial growth of the city. President McArthur of the Pacific Power & Light Company announces that the subject matter has been carefully considered and that definite plans will be presented to the stockholders in New York at once for an immediate decision.

RENTON, WASH.—W. A. Clench, secretary-treasurer Pacific Electric Welder & Manufacturing Company with works here, states that the company's representative in Australia, George H. Dowsing, reports that welder shipments to that country are steadily increasing. The company has shipped fourteen welders to date to Australia and Mr. Dowsing states further that many Australians contemplate engaging in the manufacturing business in the near future, including shipbuilding.

THE PACIFIC CENTRAL DISTRICT

VACAVILLE, CAL.—The Vacaville Water & Power Company has incorporated for \$450,000. T. L. Gates, W. E. McBride and Susan W. Inglish are the members of the corporation.

STOCKTON, CAL.—The General Motors Company is contemplating the establishment of an additional large plant for the manufacture of tractors, trucks and farm implements at Stockton.

PORTERVILLE, CAL.—S. G. Winch of San Jose has awarded W. D. Baker the contract to install a 15 h.p. electric pumping plant on the Winch orange grove at Plano. The plant is to cost about \$3500.

FRESNO, CAL.—The Railroad Commission recently gave the San Joaquin Light and Power Company authority to issue notes in the amount of \$96,500 for the purpose of renewing notes held by eleven banks in the San Joaquin valley.

QUINCY, CAL.—Pember S. Castleman of Brandy City has made application for permission to appropriate 400 cubic feet per second of the waters of the North Fork of the Feather river for power purposes. Estimated cost of the proposed diversion works is \$35,000.

TRACY, CAL.—A deal has recently been closed whereby the Toyo Industrial Corporation becomes the owner of the Vernalis Irrigated Farms, consisting of 2700 acres and situated on the river road southeast of Vernalis. The new owners will install a much larger irrigation system.

SAN FRANCISCO, CAL.—To avert a serious power shortage and threatened curtailment of development in the

San Joaquin Valley, the State Railroad Commission has authorized the San Joaquin Light and Power Corporation, which plans to spend \$3,000,000 for improvements this year, to add a 15 per cent surcharge to all bills. The surcharge period is limited to January 15, 1920.

OROVILLE, CAL.—B. L. McCoy has been employed by water users to ascertain the possibility of increasing the irrigation supply of the Bangor district. He will learn the impounding capacity of a reservoir site on Honcut creek, near Sugar Loaf Mountain. It is understood that the use of the reservoir will require some pumping.

STOCKTON, CAL.—During the year 1918 the Stockton division of the Western States Gas & Electric Company added 1,090 electric consumers to its lines. There was an increase of 7,063 horsepower in connected load, of which 5,339 horsepower represents the increased load in motors.

ANDERSON, CAL.—The preliminary work on the building of the Hoover Creek tunnel has been started by the Happy Valley irrigation district. The tunnel will be about one and one-fourth miles long and will cost about \$87,000 to build. It is expected to take about one year to finish the tunnel, and when finished it will be one of the finest and most strongly constructed passways in the United States.

WATERFORD, CAL.—The board of directors of the Waterford Irrigation District has instructed Chief Engineer Everett N. Bryan to purchase from the Sierra and San Francisco Power Company the use of 60 cubic feet of water from the flow of the Tuolumne river at La Grange, Cal., and to construct certain canal extensions, bridges, siphons and spillways designated by him as necessary new construction.

REDDING, CAL.—The Pit River Power Company is buying more land along Pit river to round out its two great power developments. A deed recorded shows that the Noble Electric Steel Company of Heroult has transferred 240 acres to the power company for \$2500. The tract is on the south bank of the river and is one mile down stream from the mouth of Potem Creek. It is four miles northwest of Round Mountain.

HANFORD, CAL.—The Mount Whitney Power and Electric Company operating in Tulare, Kern and Kings counties, has applied to the State Railroad Commission for authority to collect a 15 per cent surcharge from its consumers of electrical energy, saying the 10 per cent surcharge authorized several months ago by the commission does not provide adequate return on its property investment of \$5,313,000.

TERRA BELLA, CAL.—Plans for additional water supply for the 1919 season and for sundry improvements of the irrigation works have been worked out. Two more deep wells are to be drilled. Additional runners are to be placed in some of the pumps at the wells and at the booster station to increase supply and delivery of water. Additional service is to be provided at some of the high lands at the east end of the district.

WOODLAND, CAL.—A large increase in irrigation area in Yolo county during 1919 is indicated by the fact that the Pacific Gas & Electric Company has already made arrangements for carrying an additional load of 3000 horsepower for the purpose of operating irrigation pumps. Among the larger pumping operators will be the Alameda Beet Company, the Sutter Basin Company, the Conaway Tract and Reclamation District 107.

MONTEREY, CAL.—At the council meeting City Attorney Treat, in making a report on the rate hearing case of the Coast Valleys Gas & Electric Company, made the statement that the company will put in a current regulator here at once. This instrument, which will cost about \$5,000, will regulate the current and prevent the very decided rise and fall in voltage which is so disastrous to lamps and other electric equipment.

UKIAH, CAL.—The Snow Mountain Power Company, which generates electric energy in Mendocino county and sells current to the Pacific Gas & Electric Company for use in this section and other portions of the state, is planning a large storage reservoir for its hydroelectric plant, and in pursuance of plans which have been under way for some time, has applied to the State Railroad Commission for permission to sell 7000 shares of stock.

VALLEJO, CAL.—Vallejo is to have an improved service in the way of electric lights. The consumption of electricity from the company's lines has been increasing for months past. To guarantee an almost continuous service, work has already been started on the building of a duplicate transmission line from the North Tower station of the Pacific Gas & Electric Company to the local company's central distributing station at the foot of Kentucky street. The cost of the improvement will be about \$10,000.

SAN FRANCISCO, CAL.—As a result of the negotiations for the reorganization of the Oakland, Antioch and Eastern Railway, the Oakland and Antioch Railway and the San Ramon Valley Railway, which have extended over a number of years, a new corporation to be known as the San Francisco, Oakland and Sacramento Railway is to be formed to take over the properties of the reorganized companies, announcement to this effect having been made.

FRESNO, CAL.—Fresno Irrigation District, containing 240,000 acres and with more than 4000 land owners, is being organized. Improvement of the irrigation service 50 per cent, covering more land with a greater supply of water, the placing of the water service in public instead of private hands and the making possible of the \$9,000,000 Pine Flat reservoir project whose dam will secure the irrigation of in excess of a million acres, are some of the results expected of cooperative ownership.

PORTERVILLE, CAL.—Announcement is made by A. J. Bolin, the head of a Kansas City syndicate, that work is to be started in the near future on the development by them of a 1000-acre orchard and vineyard property. It is stated by the owners that the tract is to be leveled, irrigation system installed and vines and trees put out as rapidly as they can be secured.

BAKERSFIELD, CAL.—The Southern California Edison Company will improve its properties in the San Joaquin Valley, according to papers filed with the application of the company to sell securities to the amount of \$16,000,000. The company now has a power plant in Kern River canyon, built at a cost of several million dollars, which was completed in 1907. Two years ago they applied for permission to divert water for another large dam on the same river. This work, it is estimated, will cost several million dollars and will be started during the present year.

STOCKTON, CAL.—Indications that a joint pole agreement will be submitted to the trustees of Martinez were seen recently in a meeting held at the offices of the P. P. & E. at which representatives of the three companies interested were present. There was also present a member of the "joint pole commission" which is an independent body and which is appointed by agreement between the power companies of the state. This is in response to a notice from the city trustees served on the power companies, stating that it was the intention of the board to order all lines underground when the new streets were laid.

THE PACIFIC SOUTHWEST

HUMBOLDT, ARIZ.—The Humboldt Improvement Company is contemplating the construction of an electric light plant and waterworks system, to cost about \$200,000.

FLORENCE, ARIZ.—Plans are being prepared by Burns & McDonnell, consulting engineers, Inter-State Build-

ing, Kansas City, Mo., for improvements to the municipal lighting system waterworks, to cost about \$80,000.

SUPERIOR, ARIZ.—A company has been organized, to be known as the Superior Electric Power Company, to construct and operate an electric plant in Superior. The company is capitalized at \$100,000. James O'Connell of Superior is president.

BRAWLEY, CAL.—A bond issue will probably be issued by the Imperial Valley Gas Company for the purpose of establishing a holder at Brawley in order to provide sufficient storage capacity to do away with the shortage as complained of by the city.

IMPERIAL, CAL.—The Holton Power Company is clearing the site of its old building recently destroyed by fire to make room for a new concrete building, work on which is to be started within 30 days. The new substation will cost about \$6,000 and will be fireproof.

SAN DIEGO, CAL.—The La Jolla electric line has been incorporated with \$250,000 capital stock to purchase part of the right-of-way of the abandoned La Jolla Railway from Bird Rock to La Jolla and construct an electric line to connect with the Mission Beach electric line. The project will cost \$108,000, of which \$54,000 will be paid to the old La Jolla company for track.

LOS ANGELES, CAL.—Plans for removal of tracks from that portion of Harbor Boulevard, between Fourth and Sixth streets in Pedro Heights, and the construction of a handsome new passenger station on the east side of the Boulevard between Fifth and Sixth streets, were laid before the Harbor Commission by the Pacific Electric Company. It is estimated that the new station and relocation of tracks will cost \$50,000.

LOS ANGELES, CAL.—An application has been filed with the California State Water Commission by George I. Lamy of Los Angeles for permission to appropriate 120 cubic feet per second of the waters of Lake Elsinore, in Riverside county, for the irrigation of 20,000 acres of land. Diversion works are to consist of an open canal partly lined with cement, the main conduit to be forty-two miles in length. The work is to cost \$700,000. A similar application for the use of the waters of Lake Elsinore for power purposes has been filed by Lamy, who states that the work will cost \$300,000.

THE INTER-MOUNTAIN DISTRICT

KALISPEL, MONT.—The council has adopted a resolution providing for twenty-nine lighting districts in the city.

SALT LAKE CITY, UTAH.—The Bamberger Electric Railroad Company is considering the purchase of one automatic substation equipment to convert present manual control.

HELPER, UTAH.—The city council is planning to rebuild penstock and intake works for the hydroelectric plant, recently destroyed by flood. The cost is estimated at about \$10,000.

GARDNERVILLE, NEV.—The Douglass Milling and Mining Company are making provisions to install another hydroelectric unit of 150 kw. capacity. They operate in and around Gardnerville.

MANTI, UTAH.—Plans are being considered by the city council for extensions to the municipal electric system, including enlarging the present flume, extensions to the distribution system and construction of a hydroelectric plant, to cost about \$10,000.

FORT COLLINS, COL.—Bonds to the amount of \$100,000 have been voted for the purchase of the local street

railway system, owned by the Denver & Interurban Railway Company. Of this amount \$75,000 will be used to pay for the railway and \$25,000 for improvements to the system.

CARSON CITY, NEV.—A bill is being introduced into the legislature to register professional engineers. The bill as proposed is not mandatory in its provisions, as anyone can practice engineering without being registered.

BURLEY, IDA.—Cottages at Minidoka Dam and pumping station were completed last month. Some concrete structures were repaired and installed. The bunk houses at the Second Lift pumping station was repaired, and work was begun on a new barn there.

PROVO, UTAH.—It is reported that construction of the Soldier Summit-Strawberry railroad will begin in the spring. An agreement between the railroad and the Utah Light & Power Company of Salt Lake has been effected. As the result the railroad will be an electric line.

MOSCOW, IDA.—The proposal to install a municipal electric light and power plant is awakening much interest. The committee appointed by the council to investigate the feasibility of the plan is getting figures on the probable cost of installation and operation and the amount of business that could be expected.

PHOENIX, ARIZ.—A municipal gas and electric plant is in contemplation at Tempe. A committee of citizens has been appointed to act with a committee from the city council to make necessary arrangements with engineers to procure plans and specifications for the proposed plant and bonding election to be voted upon by Tempe citizens.

OGDEN, UTAH.—The Emery Valley Reservoir and Coal Company and the state land board are making negotiations whereby the transfer and sale of the surplus storage rights owned by the State of Utah in the flood water of the upper Sevier river will be enacted. Approximately 100,000 acres would be watered by this surplus.

BRIGHAM, UTAH.—At a mass meeting held recently the city council was authorized to install a new street-lighting system, to cost about \$12,000. The lamp poles now in the middle of Main street, from Third South to Forest street, will be removed and ornamental standards erected on either side of the street; also from Main street to First street West on Forest.

RENO, NEV.—A curious situation has developed here on account of the joint action of the Federal Government and the state in their efforts to exterminate "varmints." The results have been very good to the sheep and cattle industry and even to game, but the rodents also have benefited, and in many places it has about driven the farmer to distraction. One farmer claims a loss of \$10,000 on his wheat crop.

PUEBLO, COLO.—Street railway business is reported unusually good. The Arkansas Valley Railway Light & Power Company shows an increase for the month of January of 15,000 passengers carried, over January, 1917, which was one of the best months in the history of the railway department. The company is receiving many applications for power in rural districts for irrigation purposes and from mine operators for operation of their mines.

BOISE, IDA.—Extension of the "underground district" of the city, whereby all overhead electrical construction is eliminated, is advocated by Fire Chief Foster in a recent report made to the city council. He is therefore recommending that the "underground district" as at present constituted be extended to take in all of the territory between the railroad tracks on the south, to and including Jefferson street on the north; from Sixth street on the east to Sixteenth street on the west, between the railroad and Main street, Fourteenth street from Main to Idaho, and Twelfth street from Idaho to Jefferson.

THE VACUUM CLEANER

THE VACUUM CLEANER

TAKING COUNT OF STOCK always reveals the fact that there are numerous small articles of considerable value whose existence has been overlooked. A perpetual inventory system in some measure obviates this difficulty. The Vacuum Cleaner department has been designed to meet a similar need, that is, to place on record those bits of conversation and incidental interest which otherwise might slip to the back of the shelf.—The Editor.



An American Celebration in Germany was the occasion of the program, of which a reproduction is made below. The printing establishment evidently possessed only the German type, with this result:



Christmas Entertainment

For the soldiers, by the soldiers and of the soldiers
514th Sanitary Train, 89th Division,
Army of Occupation, U. S. f.

Bitburg (Germany) .	Echternach (Luxembourg)
7 P. M. December 24, 1918.	7 P. M. December 25, 1918.
Echternach (Luxembourg)	Wissenius-Weber
2 P. M. December 25, 1918	Hall, Rue de la Gare.

First comes a concert with ragtime galore
By the band from ambulance three fifty four :

Sgt. Sheets is Director, Die Mual plays Cornet
Patton plays Trombone, Floyd Gipple Clarinet
Wolf looks the Sax, and Mumford the "Sax"
Coff blots the Bass, with an Ironclad tip.
McC. Cambley plays "Pachhorn", and Walters Sazaphane
Benedict the Bag Drum, and Weiss Baritone
Fraxell plays Alto, and Dwyer Cornet
And Taylor plays Snare drum and works up a sweat.

Next comes a minstrel by soldier boys brave
If dockstader could see he'd turn o'er in his grave
The four end-men niggers whose names are below
Will hand you a laugh all through the show:

"Candy" Cunningham of whom you have heard
Wm. J. Toß is also some bird
F. Galt, Mogle is known very well
C. P. Sheridan can sing and raise — — —

One of the performers of the occasion was young Frederick D. Galloway, son of a member of the Journal of Electricity's organization. He was only sixteen years of age on entering the army—probably the youngest boy who enlisted here in the West, but he made good. He was on the program of this occasion for a share in the minstrel show, where his tenor voice was evidently much appreciated.

More truth than poetry is contained in this little poem sent in by A. G. Wishon. The author is unknown but he evidently knew what he was talking about:

THE ENGINEERS

(Tune: "Son of a Gamboller")

Who is the man who views the mines and promptly turns them down?
Who is the one that thinks this is the short cut to renown?
Who is it gives the bum advice to the innocent financier?
The knowledge-feigning, theory-straining mining engineer.
Who steals our gold and silver, and copper, zinc and lead?
Who takes the joy all out of life and strikes our high hopes dead?
Who never wrote a schedule that to anyone else was clear?
The sulphur-belching, miner-welching smelter engineer.

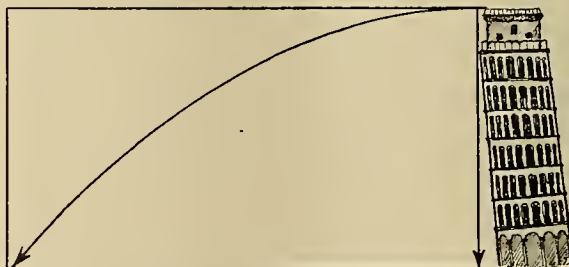
Who is the man designs our pumps with judgment, skill and care?
Who is the man that builds 'em and keeps them in repair?
Who has to shut them down because the valve seats disappear?
The bearing-wearing, gearing-tearing mechanical engineer.
Who buys his juice for half a cent and wants to charge a dime?
Who when we've signed the contract can't deliver half the time?
Who thinks a loss of twenty-six per cent is nothing queer?
The volt-inducing, load-reducing electrical engineer.
Who is it takes a transit out to find a sewer to tap?
Who then with care extreme locates the junction on the map?
Who is it goes to dig it up and finds it nowhere near?
The mud-bespattered, torn-and-tattered civil engineer.
Who thinks without his products we would all be in the lurch?
Who has a heathen idol which he designates Research?
Who tints the cheeks, perfumes the air, and makes the landscape drear?
The stink-evolving, grass-dissolving chemical engineer.
Who is the man who'll draw a plan for everything you desire?
From a transatlantic liner to a hairpin made of wire?
With "ifs" and "ands," "howevers" and "buts" who makes his meaning clear?
The work-disdaining, fee-retaining consulting engineer.
Who builds a road for fifty years that disappears in two?
Who changes his identity, so no one's left to sue?
Who covers all the traveled roads with filthy, oily smear?
The bump-providing, rough-on-riding highway engineer.
Who takes the pleasure out of life and makes existence hell?
Who'll fire a real good-looking one because she cannot spell?
Who substitutes a dictaphone for coral-tinted ear?
The penny-chasing, dollar-wasting efficiency engineer.

—ANONYMOUS.

Electrocuting the Cootie is the subject matter of a letter recently addressed to the Editor by B. F. Jakobsen, consulting engineer of San Francisco, as follows:

Permit me to call your attention to what I believe to be a somewhat novel use to make of electricity and what might be termed "an attempt to electrocute body-lice in situ." Quoting from The Scientific Monthly February 1919 issue, article by Dr. O. L. Howard, Chief Bureau of Entomology, U. S. Department of Agriculture, page 116:
"By a special request of the Electro-Therapeutic Branch of the office of the Surgeon General of the army, investigations were made of a high frequency generator as a control means against the body louse, and as a result of these investigations suggestion was made as to the possible application of high frequency electric treatment for the control of scabies and other skin-infecting parasites. Cooperative investigations along this line are about to be taken up."

ENGINEERS OF YESTERDAY—4. GALILEO
(A Series Compiled by A. L. Jordan)



If a cannon ball were fired horizontally from the top of the leaning tower of Pisa (see diagram), and another were let fall at the same instant, which would strike the ground first?

In spite of appearance, both would arrive at the same time. The laws governing such actions were discovered by Galileo. His first experiment at the tower of Pisa was made in 1590 and showed that a 100 lb. shot and 1 lb. shot fell and struck the earth together. He also discovered (in the cathedral of Pisa) that the rate of a pendulum depends on its length rather than the magnitude of its swing, a fact upon which the value of a pendulum clock as a timekeeper depends. He invented one form of telescope, discovered the principle of the "parallelogram of forces" and other principles of mechanics. His teaching that the earth revolves about the sun antagonized the authorities and he was imprisoned for most of the remainder of his life.

This Issue: The Western Opportunity in the Present Business Situation

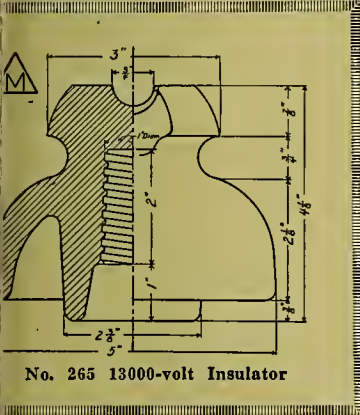
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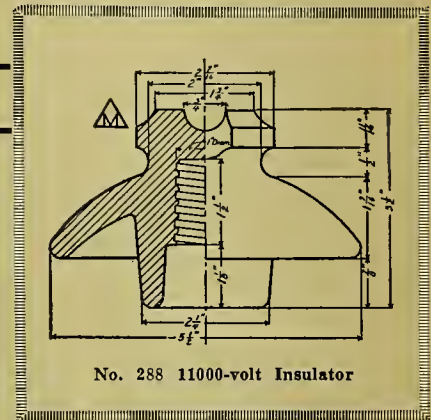
VOL. 42 NO. 6

SAN FRANCISCO, MARCH 15, 1919

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, MARCH 15, 1919

NUMBER 6

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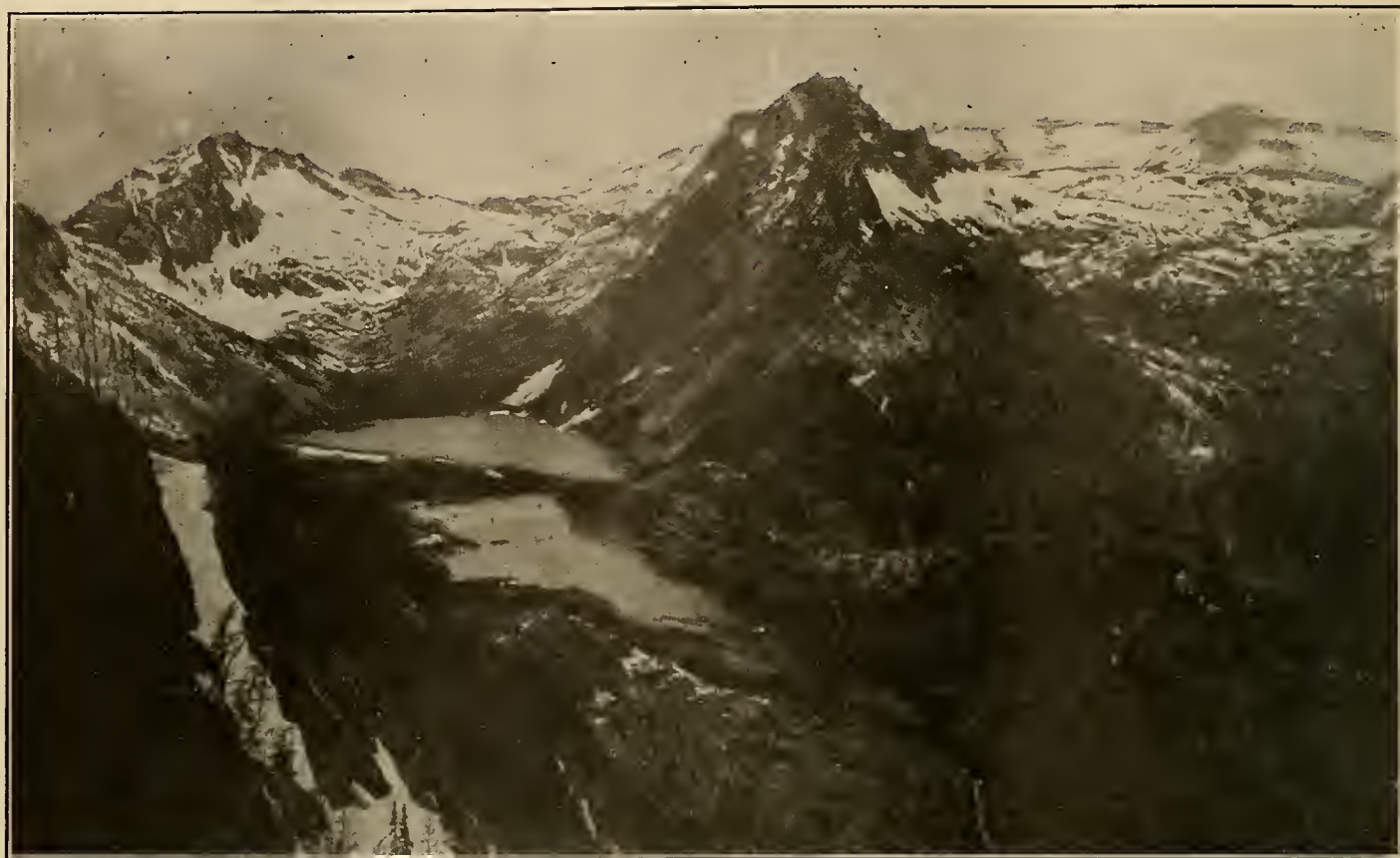
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OPTIMISM PREVAILS IN THE WEST

THE recent announcement of the Great Western Power Company that it has sold its \$7,500,000 in securities and will commence immediately on the installation of the first unit of 40,000 kilowatts that ultimately will total 120,000 kilowatts in capacity, upon the picturesque power site shown to the left, constitutes but one of the several mammoth announcements that have been recorded in the Journal of Electricity since the new year concerning new power development in the West. Others are the Southern California Edison Company, the San Joaquin Light & Power Corporation, the Sierra & San Francisco Power Company, and the Utah Power & Light Company.

The Great Western Power Company has sold its \$7,500,000 and will begin immediately the development of 40,000 kilowatts in its new plant, ultimately to have 120,000 kilowatts capacity.

The Southern California Edison Company, with its recent \$16,000,000 securities issue disposed of, is starting at once on a development that will represent an outlay of \$45,000,000 during the next ten years, merely for installation expense in its Big Creek development.

Recent bond issues have been successfully floated by two of the great companies of the Northwest—and plans are under way for developments in that region.

According to Major Sever of the War Industries Board, the program in California alone for the next five years demands the expenditure of \$80,000,000.

Not only do the plans of the power companies throughout the West reflect an optimistic spirit, but a survey of business conditions on this coast, such as appears later in this issue, indicates that manufacturers and wholesale merchants look forward as well to a period of great prosperity close at hand.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, MARCH 15, 1919

Number 6

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THE UNIVERSITY PRESIDENT—WHAT IS NEEDED

The fact that the twenty thousand alumni of the University of California, now the second largest university in America, await with breathless interest the decision of the Board of Regents as to who shall be the next president of this great institution, leads thoughtful men to ponder seriously the ideals that should pervade the new university in this day of world readjustment. We must agree with Theodore Roosevelt, in his address in the Greek Theatre at Berkeley in 1911, when he said that our great universities, while paying heed as they ought to turning out men and women who will be of practical service in the life of the state, should also remember that our national life will be hopelessly one-sided unless we also steadfastly turn our attention to developing the kind of men and women who shall be masters in exceptional kinds of work; unless in addition to vocational training we have a cultural training which shall fit men to do the highest and best work in the fields of literary and artistic endeavor, and in the field of pure science,—of abstract science, of science not pursued with any expectation of making it immediately remunerative.

But to meet the needs of the hour the new university must be prepared to give even more. The great crying need of the hour is for vision—vision to see beyond the jealousies, the hatred, the avarice, and the entanglements due to petty considerations of race, religion, or localized community of interest—vision that will offer more of hope and courage to humanity as a whole. On the Pacific Coast where the same waters wash the shores of the new civilizations that wash the shores of the oldest civilizations of the world, perhaps this need is even more emphatic.

Hence the man to undertake such a task as that of the presidency of the University of California must be one familiar with the ideals of the Eastern civilization, yet whose very heart throbs pulsate with the life-giving energies of our great West and what it has in its native values to offer of helpfulness to humanity. He must be a man of courage—a man of conviction—a man of vision—such characteristics may indeed be said to make up the scholar in the highest sense of the word.

And no other type of man will be satisfactory to the people at large, for such a man is needed to direct the affairs of this, one of the world's greatest and most influential institutions of learning, and thus make possible the fullest contribution the West may have to offer in giving of its best toward shaping the destinies of the world.

Legislation is under way in several commonwealths of the West concerning the enlargement of the jurisdiction of inspection.

The Master Electrician

The bill now before the California Legislature calling for the licensing of the master electrician under the jurisdiction of the California Industrial Accident Commission should receive careful and thoughtful consideration. This bill as drawn will not disturb the inspection departments within incorporated cities, but will of course necessitate all electricians having a certificate of competency before approval of work performed will be issued by the Accident Commission.

A movement such as this which looks toward a state-wide uniformity in electrical installation under competent inspection and approved workmen is to be commended.

It is estimated that the yearly fee of \$25.00 per master electrician's certificate issued will, from the 600 eligible master electricians in the State of California, return an annual sum of about \$12,500. The operation of the enactments of the bill will entail an annual expenditure of approximately \$125,000. It is proposed to raise this amount by assessing each unit installed in amounts ranging from \$0.60 as a minimum to \$10.00 as a maximum. Figured on the total cost of installation the tax represents about one-half of one per cent of the cost of installation.

On the whole a movement such as this looking toward state-wide standardization is unquestionably a leaning in the right direction. It merits the thoughtful and earnest consideration of all branches of the industry. If any defects are to be found they should be adjusted so far as possible so that the industry as a whole may stand back of the movement.

In these days of educational enlightenment by publicity it might be well here to call attention to one of the splendid points in utility service that the public has entirely lost sight of — namely, the almost inconceivable wonders that have been wrought in maintaining continuity of service. Few realize its magnitude and little appreciation is shown as a consequence by the public at large. The motion picture is perhaps one of the best methods of reaching the public mind. One thrilling and extremely instructive setting could be staged by showing the interior of a power house during a storm. Very few people have any idea of the effort made to prevent shut-downs or how busy an operator must be under such conditions, with calm nerve and steady hand. Real life and intense interest can be brought out by picturing the circuit-breaker flashes and the line kick-outs, or an overloaded rotary converter so far out of phase (by the synchroscope) that the operator, to use his own language, has to “kick” it back a cycle or sometimes two or three. Only those who have witnessed such scenes can picture the thrill that one experiences at such times.

This is only one instance of the many possible movie scenes that could be used to give the public some conception of the modern demands for continuity of service. The effect of such a setting in creating favorable public opinion and making better-satisfied consumers should not be overlooked.

One factor that must be remembered by electrical men in casting their vision across the Pacific with a view toward foreign interchange is the all-important question of credit. During the stirring war period foreign orders have largely been taken cash paid in advance. It must be remembered that Great Britain and other large exporting countries have built up their supremacy by extending long time credits. In many South American countries, for instance, cash means payment within six months while credits frequently extend over a two year period.

The splendid new American banking branches that are fast being placed abroad will do much to alleviate the credit situation but the business house must be prepared to face the long time credit situation.

The waste of the small order coupled with the inopportune or rush order constitutes an evil that must bear continual watching from all branches of the industry. As an instance of how the small order affects the selling price, one prominent electrical supply jobber states that he finds that the parcel post delivery necessitates an increased cost price of at least eight per cent.

The inopportune or rush order on the part of the contractor-dealer and other branches of the

industry can in large measure be obviated by more thought and care in planning ahead the work to be undertaken. The early Monday morning rush order upon the supply jobber can completely be eliminated by such care and forethought.

While these matters seem trifling in themselves they are nevertheless of great importance in the aggregate.

The preliminary report of the water-power committee of the Conjoint Board of Scientific Societies in England has just recently been issued. According to this report the water powers—developed and undeveloped—of the leading countries of the world appear in the following order.

The power now being used in the various countries of the world is estimated to be of the order of 120 million h.p., made up approximately as follows:

World's factories, including electric lighting and street railways.....	75 million h.p.
World's railways	21 million h.p.
World's shipping	24 million h.p.
This includes all steam, gas, and water-power.	

Of the 75 million h.p. used for factories and general industrial and municipal activities, a rough approximation of the most probable distribution would appear to be:

United Kingdom, 13 millions; Continental Europe, 24 millions; United States, 29 millions; British Dominions and Dependencies, 6 millions; Asia and South America, 3 millions.

An estimate by the Dominion Water-Power Branch of the Canadian Department of the Interior, outlines the hydraulic situation of the various countries, as follows:

Country.	Population (latest available figures).	H.P. available (1915 estimate).	H.P. developed (1915 estimate).	Per cent utilized.
United States	92,019,900	28,100,000	7,000,000	24.9
Canada	8,033,500	18,803,000	1,735,560	9.2
Austria-Hungary	49,418,600	6,460,000	566,000	8.8
France	39,601,500	5,587,000	650,000	11.6
Norway	2,302,700	5,500,000	1,120,000	20.4
Spain	18,518,100	5,000,000	440,000	8.8
Sweden	5,521,900	4,500,000	704,500	15.6
Italy	28,601,600	4,000,000	976,300	24.4
Switzerland	3,742,000	2,000,000	511,000	25.5
Germany	64,903,400	1,425,000	618,100	43.4
Great Britain	40,831,400	963,000	80,000	8.3
Russian Empire	182,182,600	20,000,000	1,000,000	5.0

From this it appears that between 15 and 16 millions of the world's industrial horsepower is at present developed from hydraulic resources. The following table, according to the Electrical Review of London, shows approximately the hydraulic power developed in the various regions, and also the ratio of this to the total industrial horsepower, excluding railways:

	United Kingdom.	Continental Europe.	United States.	Colonies.
Millions of h.p.....	.08	6.5	7.0	2.0
Percentage of total industrial h.p.	0.6	27.0	24.0	33.0

A cursory examination of this information shows that the United States of America is blessed to a greater degree than any other nation in undeveloped water power. By combining these possibilities with those of Canada to the north it is seen that the

northern part of the North American continent has a greater total by far in undeveloped power resources than all the countries of Europe combined, barring of course, Asiatic Russia.

It is interesting to note in passing that the combined power for shipping and for railways of the countries as listed is 45 million horsepower as compared with 75 million horsepower used in the world's factories, including electric lighting and street railways—slightly half as much. On the other hand the sad thing to note is that the sum total of power now used in the world is of the order of 120 million horsepower, while the complete undeveloped water power of these nations is but 100 million horsepower.

Hence even the most optimistic viewpoint of the ultimate utilization of water power in the industries shows even at this early date that there is not sufficient undeveloped water power existent to carry on the industrial life of the world even though all of this power could be economically developed.

Due to the importance of the grape industry and the possible effect prohibition will have upon this great agricultural asset of the West, in whose manufactured products electricity is playing an ever increasing role of usefulness, the Journal of Electricity early this year undertook a special investigation of the possibilities of marketing grape syrup. The University of California through its agricultural department quite recently issued Bulletin No. 303, in which some important investigations were disclosed. Editorial comment was made in the Journal of Electricity for January 15, 1919, calling attention to the splendid possibilities of grape syrup—a new undertaking that might grow into a cast industry of over four million dollars in value of the raw product.

From an investigation among prominent manufacturers of molasses and syrups of the Southern States undertaken by the Journal of Electricity, it would appear that there are only five things to consider in a syrup or molasses—flavor, color, sweetness, density and baking or cooking properties. A person is not in a position to judge any of those qualities unless he has a sample to work on. Hence it is very important that samples be sent to a widely distributed number of districts throughout the nation.

Corn syrup owes its popularity to its mild flavor and low cost to the consumer. Maple syrup, with its delicate flavor, appeals to the wealthier consumers, but the volume of sale is limited by the high price.

In the South pure sugar cane syrup has a larger sale than corn syrup and maple syrup combined. This cane syrup retails ordinarily at about \$1.00 per gallon.

Just how grape syrup would work into the syrup family is hard to tell—this can only be determined after considerable study. It probably will take several years to develop a large volume of business on a new grade of syrup. Advertising alone will not create a demand. Advertising is like artillery which reinforces the infantry, or salesmen who interest the retail grocers. Retailers require a profit of about 30%. The wholesale grocer will not handle a product until the manufacturer creates a demand from the retail grocers, and the jobber requires a profit of about 15%.

A new product often requires house to house canvassers and demonstrations. It is not much use to advertise until a reasonable distribution has been obtained among the retail grocers. One manufacturer states that nearly a half-million dollars was spent advertising his molasses in national magazines before there was any distribution, and those who were interested by the advertisements were unable to secure the syrup from their retail grocers.

It would seem, then, an unwise undertaking to attempt to put grape syrup on the market in volume in an effort to save this year's production of grapes. If some other outlet can be found for most of this year's grapes and only a comparatively small amount of syrup produced this year, the product could be tested in, say, one hundred markets scattered over the United States, and its future could then be figured out.

In this connection, the present market prices of pure sugar cane syrup are interesting and instructive. Pure cane syrup, which the planters were selling to the dealers around 70 cents per gallon this last summer for future delivery, is now selling at about 50 cents. The planters' price for syrup to dealers is normally about seven times the price of yellow clarified sugar. Bearing these figures in mind, one may formulate a comparison with the prospective cost price on grape syrup. The price of cane syrup should be considered as well as the first-hand cost of maple syrup.

These figures should not discourage western enterprise from proceeding further in this helpful investigation. They give conservative statements of what must be overcome to successfully market this splendid product, and as a consequence a bed-rock foundation is laid upon which western genius will unquestionably successfully build.

THE NEW JOURNAL SERVICE: Electricity as an aid in increasing port facilities for the handling of cargoes will be treated extensively in the Journal of Electricity for April 1, 1919. This subject is of vital interest not alone to the contractor-dealer, to the central station, to the jobber and to the manufacturer—vast as may be their interest—but to the upbuilding of the commercial supremacy of the West it is of prime importance. This interesting survey hence will prove a new Journal service of great timely importance. Beginning with the April first issue, two important series of articles will be featured, both of which are announced in this issue. A course in "Fundamentals of Electricity" will be presented in conjunction with the extension department of the University of California which will be of interest in the individual articles, and as a whole a complete review of the basic elements of the science. A series of papers on "The Business Library" will also commence in this issue, which will take up the problems of organizing records for the small business as well as the large. Remember that the April 15th Convention Issue will feature all the papers of the coming Pacific Coast Section N. E. L. A. Convention.

THE BUSINESS SITUATION IN THE WEST

BY W. M. DEMING

(Should you hesitate to expand your business? Are times to be good or bad? Will prices go down suddenly? A survey of the business outlook in the West by the general manager of the Journal of Electricity as presented before the recent Jobbers' convention at Del Monte. A group of letters from manufacturers judging the situation as they see it supplements the survey.—The Editor.)

The business situation is changing rapidly—almost from day to day—and there are so many different points of view from which the subject must be considered and so many problems—international and otherwise—which, while seemingly irrelevant, have an important bearing on business conditions in all sections of the United States, that it is difficult to express or even form a reliable and concise opinion on the subject.

Manufacturer's View of Situation

In order to give some idea as to the present day outlook in the electrical industry a telegram was sent to a number of representative manufacturers in various lines, requesting their views. The replies are not only varied but interesting and form an index to the wide diversity of opinion among business men who are unquestionably in close touch with and watching the situation carefully.

Era of Prosperity

In the first place, there seems to be no question whatever but that the United States is in a position to enjoy the greatest era of prosperity in its history, provided we grasp the opportunity. How soon we may begin to derive the actual benefit of this prosperity depends to a large extent, if not entirely, on what steps we take to hasten its arrival.

The sudden ending of the war found us almost as unprepared to readjust our business to a peace basis as we were when suddenly drawn into the conflict, but there can be no question as to our ability to handle this problem with the same rapidity, efficiency and thoroughness shown in mobilizing our resources for war.

It is necessary, however, to apply to the present problem the same enthusiastic unanimity of purpose displayed in helping to win the war.

Danger in Pessimism

The pessimist is as dangerous a factor in the present business situation as the pacifist was a few months ago, for there is a psychological factor which plays a very important part in the business world, and economic conditions must not only be considered as they are but as other people think of them as well.

Although we are in a period of temporary uncertainty, or hesitation, the situation will appear alarming only so long as we wait to see what the other fellow is going to do.

Building and Labor Situation

The labor situation may doubtless be considered the controlling factor of business today. There seems little prospect of any radical reduction in wages as long as the cost of living remains at its present level; in fact, the Department of Labor predicts a shortage of several million men by late spring.

There seems to be a tendency to delay building operations in the hope that prices may drop materially, but there are many sound arguments against the possibility of any sharp decline—the most general opinion being that prices will show but little change for six months or more, at least.

On these detail points we have no precedents to guide us, and one guess is as good as another, but we can and should continue to show our loyalty by acting, preaching and urging optimism. The return to normal business life will not be accomplished by worrying over what may happen, but can be accomplished by doing the tasks at hand and establishing, by our own acts and example, a strong confidence in the certainty of business prosperity being close at hand.

REPORTS FROM MANUFACTURERS

Representatives of one of the largest manufacturers of electrical apparatus and material advise that although public utilities in some sections of the country are from three to four years behind their normal expansion, there will be relatively little activity in either the lighting or railway field in the direction of further extension, for the present at least. However, there seems to be considerable activity among industrial plants. A large number of them are planning extensions and consulting engineers are particularly active at this time. A good business in household appliances is anticipated during the coming year. High costs and difficulty in securing additional capital at reasonable rates is retarding general building operations.

The Bryant Electric Company find the outlook for this coming year a bright one:

The Bryant Electric Company is very optimistic regarding the business outlook for 1919. Our circumstances may or may not differ from those of other firms whose product is handled by electrical jobbers throughout the country. At any rate, while our business during 1918 was almost wholly direct or indirect war work, it was likewise almost wholly made up of our standard catalogued product which was in large demand in contronments, navy yards and industrial establishments. Therefore, a return to peace conditions does not in our case involve anything even approaching a revolution in our factory processes. We shall be able to continue making the same character of goods that we have for years past. The question we are asking ourselves, and the question which our distributors are asking of us, is what demand is there going to be for Bryant standard product during 1919. Again we are most optimistic. It is over two months since the Armistice was signed and the anticipated slump has not come. This is doubtless due to the fact that building operations which were halted at the beginning of the war have already gone forward. Other buildings of the character which can or must be carried through regardless of the cost of building construction will doubtless start just as soon as uninterrupted weather conditions are assured. To sum up, therefore, we would say that business prospects are brighter and the probability of lower prices more remote than they seemed two months ago.

While there have been some slight reductions in the prices of raw material, they are offset by the continued in-

crease in the labor rate. Continued strikes seem to indicate that the present rates of labor will be continued and the high cost of living maintained for some time to come.

F. V. BURTON,
General Sales Manager,
The Bryant Electric Company.

Pass and Seymour express themselves as follows in a telegram:

We feel very optimistic regarding prospects for 1919. We realize conditions have changed from a buyer's to a seller's market and that it will be a poor year for so-called order takers, but a good one for well regulated sales campaigns. We expect market prices to remain staple throughout the year, labor affecting this more than the price of raw materials. Whatever slight setbacks occur are only temporary disturbances in a long period of general good business.

PASS & SEYMOUR, INC.

The American Conduit Manufacturing Company express themselves as in favor of an optimistic outlook:

We are in a waiting market. The war demand is ended and the peace demand has not yet developed. Just as it was patriotic to refrain from carrying on general construction work during the war, it is now a matter of patriotic duty to immediately start all kinds of construction work. The general shortage of dwellings and all sorts of commercial buildings has brought about congested living conditions and has placed many obstacles in the way of properly conducting business. The country needs not only dwellings and buildings but good roads, bridges, power plants, water power development, and parks. At the very moment that the problem of the unemployed takes on a most serious aspect these two forces must be brought together, not only for the benefit of labor and our national morale, but also for the benefit of capital which, if courageously employed at this particular time, will reap a tremendous reward long before the demand for these new developments has been satisfied. Therefore do not wait for lower prices—act now.

THE AMERICAN CONDUIT MFG. CO.

The National Metal Molding Company looks forward to prosperity after some delay due to labor readjustments:

Business is at present facing, in a national way (necessitating the slowing down of activities), the problems of labor adjustment from war to peace basis, settlement of the principal problems before the Peace Congress, and the flotation of the forthcoming fifth governmental loan. These problems may take most of this year to solve. In fact, it may run into the coming year of 1920.

The brighter side of the picture reflects the following conditions:

The United States is emerging from the most disastrous war in the world's history as a creditor instead of a debtor nation, with a per capita wealth having increased during the war period nearly fourfold, and with the acquisition of the most friendly feelings towards us of all the allied nations and, in fact, all nations of the earth, and a recognition of the wonderful and astonishing achievements of our nation in the participation in the world's conflict.

During the war period, building construction in all fields of activities in this country, except manufacturing and sheer necessities, compelled to await the termination of the war, is now anxiously awaiting the readjustment of material and labor costs to initiate the greatest building era this country has ever known, and with the accumulated wealth and assets, and fifteen billions a year agricultural production, no one could safely predict other than a period of great prosperity in this country, beginning in the near future.

C. E. CORRIGAN,
National Metal Molding Company.

The Allis-Chalmers Manufacturing Company is impressed with the opportunities for foreign trade:

Our president, Mr. Otto H. Falk, in attempting to forecast business outlook expresses the opinion that until such time as conditions have become more settled, there will not be a great revival of business. Reports received as to the general situation indicate that many industries have plans well developed for needed improvements which will necessitate extensive machinery installations. Purchasers however are holding back until conditions become more settled.

The government's policy in legislative matters will have much to do with determining the early revival of business. We believe that with proper effort, American manufacturers of power and electrical machinery can participate in an extensive foreign trade.

C. E. SEARLE,
Allis-Chalmers Manufacturing Company.

The Benjamin Electric Manufacturing Company is in the process of changing from government to peace time work, but feels that once started, American business is going to go with a rush:

Conditions with us are the same as in many other lines of industry. We were on government work for about 80 per cent of our capacity when the armistice was signed; we had completed some stuff and had cancellations on some orders, so that now we are in the process of readjustment. Like many other industries, our business is not rushing; at the present our overhead is a little heavy.

We find that the harder we hustle, the more business we get. It seems to fully establish the fact that this is rapidly becoming a buyer's market and that the seller will have to bestir himself to get business. In other words, the business can be stimulated by strong selling effort. As spring advances, building operations are resumed, and some other problems settled of a more or less national interest, we expect our business to assume proportions equal to our facilities. We can see no reason to express anything other than the greatest optimism as to the future of our business.

Speaking generally of American business, we don't think there is anything that can hold us back, and once we get started we are going to go with a rush. The more courage we possess, the greater energy we use, the more we are going to accomplish, and it is just in that state of mind that we must attack these problems to be successful.

BENJAMIN ELECTRIC MFG. CO.

The Hurley Machine Company is making plans for a big business in labor saving devices:

First, we do not believe there is going to be any reduction in the price of our product this year. Material is not going down very fast and labor will remain the same or go up. We find it is just as hard to get good mechanics today as it was a year ago. Of course, there is a lot of labor that you would not have to pay so much for, but the best labor still demands a good price.

Post Civil War Conditions

I was reading some facts the other day in regard to the reconstruction period during and after our Civil War. From 1860 to 1865 the business of the north was as prosperous as business in this country from 1914 up to the present time. During both periods business operated on a rising market. From 1865 to 1873 American business operated on a falling market, enjoyed the greatest prosperity it had ever experienced up to that time. At the conclusion of the Civil War prices began to decline and wages continued to increase for seven years after the conclusion of the war. In the period from 1860 to 1880 the high peak in prices came in January, 1865, and from then on there was an almost uninterrupted

decline, the index number for 1880 standing at only 4% above the level for 1860. Wages on the other hand rose more slowly during the war period and continued to rise generally until July, 1872, seven years after prices had begun the long decline. The margin of gains for the workers, the net increase in real wages maintained at the close of the 20 year period, can be roughly measured by the indices, which show a gross gain of 38% in wages in 1880 over the 1860 level, against a net increase of 4% in wholesale prices.

Cost of Living Must Decline

In other words, the cost of living must decline before wages can decline or be permitted to decline. About 60% of the cost of the average commodity sold to jobber or dealer is labor cost. The remaining 40% is material, transportation, etc. costs. Under such conditions, costs of material will have to decline materially before such decline can radically reduce costs. At present labor costs are as high, if not higher, than they were before the signing of the armistice, except in those plants where the labor cost per unit of production has been decreased by greater volume of business and greater labor efficiency. Materials, in many cases, have increased instead of decreased since November 11. These conditions I believe the jobbers and dealers should know.

Women in Business Meant Household Appliances

According to a report of the United States Department of Labor about 2,000,000 women were employed in this country in factories and plants operating to full capacity on direct war work. This figure of 2,000,000 women does not include women employed in factories and plants producing those commodities which, during the period of the war, were classed and called "less essentials." The shifting of woman labor from the home to the factory and to business, in general, was by no means as great in this country as it was in England or France, but the movement was great and large enough to create such an acute shortage of domestics and of household servants that the washing machine industry and business as a whole advanced with remarkable strides. The shifting of woman labor simply swamped the producing capacity of almost every industry producing household labor saving devices. We were unable to meet the enormous demand, but we saw it coming and built a large factory so as to be prepared for it, and by August, 1918, this factory was organized so that we could begin to give our customers reasonable service.

The signing of the armistice has not in any way decreased the demand for washing machines for household use. The shortage of domestics, household servants and of woman labor in general is as acute as ever. The United States Employment Service is continuing its work of placing woman labor just as it did during the war. During the week ending December 21st, it placed 14,943 women. These labor conditions, of course, serve to continue and strengthen the demand for washing machines.

Women Learn to Handle Machinery

We believe that the women who entered the factories during the war and who will now return to home and household duties have learned the full value of labor saving devices. They have learned that the office, factory and railroad in this country is equipped with the latest modern labor saving devices. They have learned the value and utility of such devices, and they have learned how to use them. This knowledge gained from actual practical experience, will be taken into every home into which these women, who did so much for their country during the war, enter either as housewives or domestic servants. No one can forecast the enormous demand for household labor-saving devices which will exist in this country for the next five or ten years as a direct result and heritage of the war.

A Favorable Situation

We believe that the jobbers and dealers should put themselves into a position to "cash in" on the favorable situation. The woman who during the war carried on her work as housewife, in many cases did so without the aid of servants. The shortage of domestics and the high wages they commanded made it necessary, and still makes it necessary, for many housewives to do their own washing and ironing. Housewives who have been doing their own work to release labor for direct war work are the first prospects for sales of washing machines and ironing machines and vacuum cleaners. Those women who may now return to the home and to household duties, after taking an active part in the business world, will demand the same sort of labor-saving devices which they found in the office and the factory.

The jobber and dealer should get ready to take care of this demand. I am sure that their sales on washing machines and other labor saving devices will be larger in 1919 than ever before. We are making all our plans accordingly, and have bought our stock and made our contracts for material believing all these things will come about.

NEIL C. HURLEY,

President Hurley Machine Company.

J. G. Pomeroy believes in looking the situation in the face:

It looks to me as though temporarily for the next four or five months business would be at a standstill awaiting price readjustments. Both the jobbers and manufacturers must realize that they made a handsome profit for three or four years on an up market, and that they must take a loss on a down market, and the sooner that these interests come to realize that prices must go down to a normal basis the sooner, in my opinion, will business start.

There is a great deal of talk about labor readjustments. In my opinion, labor is not over paid considering other prices, and especially laborers' living. If at the present market for labor labor would become efficient, the present wage scale could be maintained.

J. G. POMEROY.

The Westinghouse Electric and Manufacturing Company predict progress in railway electrification and electrically driven ships, together with great activity in water power development:

The disturbed markets and the general feeling of uncertainty which permeates the commercial atmosphere make it incumbent upon the electrical manufacturer to analyze the electrical field with more than usual care in order to determine what are the more important developments which may be expected within the reasonably near future, so that, knowing what to look forward to, he may shape his course accordingly and so plan his commercial policy and organization as to obtain his fair share of the business inherent in these developments. The following appear to stand out as deserving of first consideration:

Electrification of Steam Railways

On account of the increased tonnage which may be handled over steep grades by electric locomotives and because of their lower operating and upkeep costs, independence of severe weather conditions as well as the economy of fuel which can be effected by their use, it is generally agreed among electrical and railway engineers that the next few years will see the electrification by many of the more important railways of those portions of their lines located in mountainous sections of the country where grades are steep and hauling conditions difficult. The large amount of additional capitalization required will cause this development to be brought about gradually and make it dependent very largely on the money market. This is, in its entirety, of

paramount interest to the electrical manufacturer both on account of the magnitude of the undertaking and because he will be called upon to furnish practically all the apparatus involved which will include generating equipment, heavy traction equipment, transformers, trolley and transmission line material, conversion equipment for sub-stations and switching equipment for both main power houses and sub-stations.

Application of Electricity to Ships

For ship propulsion just as for the driving of large generators in central stations, the steam turbine has practically superseded the reciprocating engine. America, with upwards of 200 shipbuilding yards, is leading the world in the construction of new vessels, which activity has resulted in an unprecedented demand for large turbines, motors and switch gear on the heavier ships which are electrically driven, and of geared turbines on the more moderate sized vessels—all of which are of primary interest to the electrical manufacturer. Switching equipment, motors for auxiliaries, and lighting fixtures and equipment are also a part of the electrical manufacturer's product which must be supplied to each ship. At present the turbine manufacturing departments of practically all the electrical manufacturers are being taxed to their utmost to supply the demand incident to this shipbuilding program, and all indications point to a continuation of this condition for many years hence.

Development of Water Powers

On account of the very general popular agitation of this subject, there is every likelihood that the government will remove many of the restrictions imposed upon the development of water powers, thereby assisting in the much talked-of program for the conservation of fuel and affording additional relief to our transportation systems which already overburdened, are called upon to carry large amounts of coal. This development will involve the building of large generating and switching apparatus and the construction of high tension transmission lines with attendant sub-stations containing the usual conversion (transformers, synchronous and rotary converters) and switching apparatus. All of this equipment is fundamental to the electrical manufacturer. The extension of low priced power will encourage the further use of electric furnaces and reheating and annealing ovens, as well as all other industrial applications of electricity which are dependent on relatively low priced electrical energy. The wider use of electrically driven household and heating appliances will, of course, be encouraged, thereby furnishing an additional market for the products of not only the large but also the smaller electrical manufacturer.

These developments, of course, furnish to the electrical manufacturer and distributor a large field for the sale of conversion and switching equipment as well as motors for the handling of the innumerable auxiliaries required in electrochemical and electric furnace plants. Related to all this is the machinery required for the electrical handling of the raw materials in the mines and the extensive application of electric drive in the various crushing, grinding and refining processes so widely involved in metallurgical developments.

The recovery of ore and cement dust by means of the Cottrell processes is furnishing a market for a considerable amount of special electrical machinery which is rapidly being standardized. All electrochemical developments have been increasing rapidly and give promise of much wider application throughout all our industries.

Developments in Electrical Transmission of Intelligence

A vast amount of detail apparatus which ordinarily comes under the heading of electrical supplies will be required for the developments in the fields of the wireless telephone and telegraph, the automatic telephone exchange and

multiplex telephony. Those electrical manufacturers specializing in the manufacture of this apparatus, as well as those branches of other electrical manufacture which have to do with meters, instruments and supply apparatus will be taxed to meet the demands for the equipment necessary for this development.

It is self-evident to anyone who has given this subject even a moderate amount of consideration that the ultimate possibilities for the domestic sale of electrical apparatus loom larger than ever before.

C. G. SCHLEUDERBERG.

A representative of The Crocker-Wheeler Company quotes optimistically as follows:

The best illustration for future business which I can cite is from an article of Charles S. Calwell, President of the Corn Exchange Bank, Philadelphia, which reads as follows:

"It is natural for business to hesitate under present conditions. But do not let us hesitate too long nor expect in the near future to see prices back to a pre-war basis.

"Prices will decline, but remember for four years, as every one knows, the principal nations of the world have been producing little for general use, consuming and destroying much. Even today in many countries little is being made, much is still being destroyed.

"American business men solved the problems of war; the problems of peace should not scare us. Prepare for business."

Now as to the California situation: From what I learn I believe California is in a better position than ever before, due to the fact that the world will need for years to come California products in large quantities. It appears to me that California takes no chances to increase its productions and that means business, but my opinion is that the only way to get this business which is coming these days is to go after it, that is, creating business and bringing in business instead of waiting for business to come in.

A FEW DON'TS FOR ORIENTAL TRADE

The following sensible advice is given by Mil-lard's Review of Shanghai, China:

Don't give your agent in China (unless you know him to be reliable) an appropriation for advertising your product in China, without investigating as to how the money is to be spent. It may be used for other purposes, such as the purchase of an automobile by the manager, or the payment of his rent. Select your advertising mediums in China just as carefully as you do at home.

Don't send the office boy or an unpopular salesman you want to get away from the home office to represent your firm in China, for the Chinese business men he happens to come in contact with may be graduates of American or European universities with "Ph.D." degrees.

Don't establish a branch office for your firm in China and expect to amass a fortune in three months. Firms that have been successful in China are those who have studied the field and worked just as carefully and painstakingly as they did when the business was started at home. You can't transplant an American business and expect it to blossom overnight on the soil of China. It must acclimate itself.

WOULD YOU EMPLOY YOURSELF AS A SALESMAN?

(Would you receive a mark of 10 or 20 if you were interviewing yourself as a prospective employe? The following employment blanks in use by the Equitable Life Assurance Society are perhaps the most comprehensive of their kind and are of interest to the employer who has the problem of selecting his workers, as well as to the man who is checking up his own qualifications.—The Editor.)

The following questions make up the employment blanks used by the Equitable Life Assurance Company in employing insurance agents.

Check up on yourself and see if you would qualify—the characteristics called for are essential to success in any salesman's position:

Prospective Agent's History Blank

1. Age—Date of birth—Place of birth—.
2. Nationality—Languages spoken (besides English)—.
3. Residence—Length of time at present residence—.
4. Present occupation—.
5. Education: Indicate by check whether graduate of college—, high school—, or grammar school—.
Give name of last institution attended—.
6. Family: Indicate by check whether single—, married—, widower—, or divorced—.
Dependents—how many?—
7. Social activities: Indicate clubs, lodges, military, church or other organizations with which at present connected.
(If officer, so state)—.
8. Health: Indicate by check whether good—, fair—, or poor—.
Any physical infirmity?—.
Amount of time lost through illness within past two years—.
9. Personal life insurance carried. Old line: \$—Lodge or fraternal: \$—.
10. Previous business experience (other than life insurance) for past five years:

Name of Concern and nature of business—.
Capacity employed—.
When employed: from—to—.
Immediate Superior—.
Reason for change—.

11. Previous life insurance experience:

Name of company—.
When employed: from—to—.
Where located—.
Immediate Superior—.
Paid business: Personal—, Through Agents—.
Reason for change—.

12. Contract proposed is for (whole)— (part)— time. Field in which it is desired to operate—.
13. Finances: Indicate by check whether indebted to anyone. Yes—No—. (If so, to whom and amount—.)
Indicate by check whether living at home— or boarding—.
If former, is home personally owned—or rented—.
Indicate by check kind of property owned: personal—or real estate—.
Approximate value—.
Indicate approximately the monthly remuneration last received, \$—, and whether salary—or commissions—.
14. Corporate bond (can—) (cannot—) be furnished. (If one furnished in past, give name of surety company.)
Remarks: The prospective agent should state here, in at least fifty words, why he thinks he will succeed as a salesman for this society.

Dated—191—. (Signature of Prospective Agent.)

Note.—A photograph (a kodak will suffice) showing date taken, should accompany this blank; to be returned if desired.

Interviewer's Blank

Interviewer..... Agency.....
Date of interview..... Duration of interview.....
Where held.....

Directions: The use of this blank contemplates that a Prospective Agent will be compared under each heading, with 5 other agents who have been previously graded as a standard by the Interviewer as per the "Interviewer's Scale" and the relative standing of the Prospective Agent indicated. For example, if under "Appearance" he compares most favorably with the agent rated as Highest, the Prospective Agent should be credited with 10. Likewise, if under "Address" he more resembles the agent rated as "Average" he should be credited with 6, etc.

The Prospective Agent is rated by the Interviewer as follows:

- I.—Appearance. (Grade 10-8-6-4 or 2)
Consider how he will impress clients by his facial expression, his physique, his carriage, his clothing, neatness and cleanliness.

- II.—Address. (Grade 10-8-6-4 or 2)

Consider voice, manner of speech (whether convincing or persuasive), ability to express himself clearly and briefly, quiet self-confidence, courtesy, tact, enthusiasm, cheerfulness.

- III.—Character. (Grade 10-8-6-4 or 2)

Consider integrity, truthfulness, personal habits, economy, loyalty.

- IV.—Industry. (Grade 10-8-6-4 or 2)

Consider ambition, initiative, perseverance, systematic effort.

- V.—Mentality. (Grade 10-8-6-4 or 2)

Consider natural intelligence, versatility, general education, present insurance knowledge or aptitude to master same.

- V.—Value to Society. (Grade 40-32-24-16-8)

Consider probable value to the Society, giving due weight to all factors, including impression conveyed by "History" blank.

- VII.—Reports from Others. (Grade 10-5' or 0).....

If reports are expected but not received they should be rated as "uncertain" and indicated as 5.

	Total	.....
Allotment: Agent, if ap-	Second Interviewer	.....
pointed, should be allotted	Third Interviewer	.....
for first year \$.....	Grand Total	.....
	Average	.....

The Prospective Agent (is) (is not) recommended for appointment.

Interviewer's Scale

Directions: This blank is for use in preparing a standard by which to judge relatively of the value of Prospective Agents, and one is to be filled out by each Interviewer as his standard. Under each heading disregard every factor except what is indicated by the term. Then select that agent who, for example, you rate as Highest for "Appearance," indicate him by name under Highest—10, and in like manner indicate the agents that you would rate for "Appearance" as High, Average, Low and Lowest. In the same way classify and rate 5 agents under each heading; the same agents may appear under the different headings but will rarely be graded the same. That is, Smith may be rated as Highest under "Appearance" but as Average or Low under "Industry."

- I. Appearance.

Consider facial expression, physique, carriage, clothing, neatness and cleanliness.

Highest 10	High 8	Average 6	Low 4	Lowest 2
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- II. Address.

Consider voice, manner of speech (whether convincing or persuasive), ability to express himself clearly and briefly, quiet self-confidence, courtesy, tact, enthusiasm, cheerfulness.

Highest 10	High 8	Average 6	Low 4	Lowest 2
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- III. Character.

Consider integrity, truthfulness, personal habits, economy, loyalty.

Highest 10	High 8	Average 6	Low 4	Lowest 2
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- IV. Industry.

Consider ambition, initiative, perseverance, systematic effort.

Highest 10	High 8	Average 6	Low 4	Lowest 2
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- V. Mentality.

Consider natural intelligence, versatility, general education, present insurance knowledge or aptitude to master same.

Highest 10	High 8	Average 6	Low 4	Lowest 2
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- VI. Value to Society.

Consider probable value to the Society, giving due weight to all factors, including impression conveyed by "History" blank.

Highest 40	High 32	Average 24	Low 16	Lowest 2
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- VII. Reports from Others.

If reports are expected but not received they should be rated as "uncertain."

Favorable 10	Uncertain 5	Unfavorable 0
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Date.....

(How do you follow up your sales prospect—have you any idea of how much a customer is worth to you—what do you do when you lose a sale? Here are some of the forms and methods in the handling of customers as used by a prominent jobbing concern which are of special interest to all in the selling end of the electrical industry.—The Editor.)

end is distinctly the most important department of the business. For in any line of work, it is better to sell even a little—and sell it, than to manufacture or handle much and have it left upon your hands.

In working out this department of their business, the Pacific States Electric Company has found various checks upon transactions with customers to be of value.

In the first place each customer has a separate card and a file in which record is kept of his orders, of salesmen's calls, of telephone conversations and

A REPORT ON THE SALES PROSPECT

In some sense, each branch of the business in its transactions represents the ultimate consumer. Like the House that Jack Built, the jobber purchases from the manufacturer what the dealer will purchase from him, which in turn is controlled by what the general public will purchase from the retail store. Each branch of the industry maintains a selling force to reach its circle of buyers, each acting along the same principles with the same general aim in view—and in each case this selling

Referred to _____ Date _____ 191____

SALESMEN'S SPECIAL REPORT

Customer _____
Address _____
Business _____ Talked with _____

Remarks as to prospects, complaints, changes in plant equipment, management, officials, etc.

Signed by SALESMAN _____

TO BE MADE IN DUPLICATE—ORIGINAL TO BE REFERRED AS NOTED (FOR PROPER ATTENTION). DUPLICATE FILED
IN LOCAL OFFICE (CUSTOMERS' INFORMATION FILE)

FORM 318 IN CUP

KEEPING IN TOUCH WITH THE CUSTOMER

Any information in regard to the customer which should be recorded in the home office, such as complaints, possible visits or changes of personnel are sent in by the salesman on this blank.

the like, so that complete information is at hand as a basis for further business. The card is provided with numbers indicating the various classes of customers — i. e., contractor-dealer, industrial, central

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NAME		John Doe																			
ADDRESS		575 Mission																			
		SALESMEN																			
		CATALOGUE NO.																			
		ELEC.																			
		ENG.																			
QUARTER	1900	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923						
JAN																					
FEB.																					
MAR																					
APR.																					
MAY																					
JUNE																					
JULY																					
AUG.																					
SEPT																					
OCT																					
NOV																					
DEC.																					
TOTALS																					
PROPORTION																					
SPECIAL INFORMATION																					

THE CUSTOMER'S CARD

Each customer has a card on which is recorded his business for successive years. An estimate of his probable orders as judged by the salesman is placed at the head of the column and then the actual amount of monthly business below. This not only serves as a record of the relations between the customer and the company but is the basis for sales campaigns and serves as a check on the work of the salesman.

SELLING YOUR SALES LETTER

BY H. A. LEMMON

(Selling by mail is no different process from selling through a personal interview — and the same understanding of human nature must go into your letters as you put into your conversation. This is the first of a series of articles on the problems of the salesman which are to be written for the Journal of Electricity by the well known sales manager of the Truckee General Electric Company.—The Editor.)

Sooner or later the Contractor-Dealer will write a letter to be reproduced by the hundred and mailed to the anxiously awaiting citizens in his field. Of course these letters are issued with the fond hope that they will pull in new business and increase the old. As the old song about the girl runs "some do and some don't," but mostly they don't, and yet there is no real reason why any man who owns an electric appliance shop should not add materially to his profits with business whipped up by mail. Probably however, not one letter in ten actually brings



A baldheaded barber is not a good advertisement for hair tonic, nor are you likely to be believed if you advertise your prosperity on cheap stationery. The outward appearance of that silent salesman, your letter, is as important as your own clean collar and clean hands in waiting on a customer or in making a salesman's call.

returns that profit anybody save Mr. Burleson's department and the printer.

A sales letter is another one of those things apparently so extremely simple that it doesn't seem to amount to much and our inclination is grope about all over the place looking for ideas and smart and unusual phrases when as a matter of fact that which we are seeking is just what we must avoid.

The First Impression —

If however our Dealer is unable to make progress perhaps we can help him to at least get started by laying down a rule, as follows:

Let him make a collection of the letters from manufacturers and others which urge him to buy goods. He should read these over carefully and from nine of every ten of them he will gain valuable knowledge of what not to do.

If after mature consideration he is still determined to write a letter about his goods or his shop, let him also determine that he will dress up his communication in a manner worthy the gem it is to be. And a good deal depends on the paper upon which it is printed and the envelope in which it is enclosed. Testy dyspeptics will still whine that too much attention is given to appearance and not enough to real worth, but the fact remains that a baldheaded salesman must possess unusual skill to successfully sell hair restorer, and it is almost equally difficult to con-

vince your customer by mail that yours is a high grade business if you approach him on the thin pink sheet of his pill manufacturer. Painful as it is, the fact remains that occasionally we must trust some one and in this case it may as well be the printer. Tell him you want a letter printed on good quality of bond paper—not lighter than 20-lb. and preferably 24-lb. or even heavier, with envelopes to match both in quality and weight. An extra heavy sheet of bond paper carries with it those confidence-inspiring qualities which a clean shave and haircut give the personal salesman. The best color paper is white; although of course every so often adventurers into the threadbare real of experience will desire to experiment with tints. If our dealer is one of these let him select a tint—he might as well get it out of his system and have it over with in order that his idiosyncrasy may not mar future efforts.

How to Begin —

It perhaps is an undue display of confidence to select the paper before we write the letter, but we will get to that at once. First of all, we must remember that this is to be a business letter and not a scenario for a vaudeville turn; that is, we do not want anything cute, cunning or humorous in it. To ask a woman to pay \$52 for a suction cleaner when her sister purchased the same thing for \$29 before the war is not considered very much of a joke in the best circles.

Without straining our intellects to the point where a headache will result, we probably can agree that it will not matter so much how good a proposition we may offer in our letter if the woman who receives it merely glances at it and throws it aside. And yet as soon as she heard the postman's whistle she dropped her sewing and rushed out to get the mail—not that she expected anything specially but because she is of a hopeful disposition and thinks something interesting might arrive some day. So we know that she really wants to read our letter if we will only frame it so she can, and if it is interesting she will do so even to the extent of allowing the biscuits to burn. We may be justified in the conclusion that the opening sentences must compel her attention. Even then, however, she may read a sentence or two and unfeelingly fracture our hopes by chucking our effort into the garbage pan. Therefore we must not only gain her interest but must keep it. We may pardon her if, having given us her attention, she is curious to know what we are going to do with it—and that of course is disclosed in our "proposition," without which we may as well have saved the printer's bill. And thus by comparatively painless stages we come to the "close," which is by no manner of means the least important of the

whole. If we all can agree up to this point we will assert that any sales letter to be successful must contain at least three elements: an interest-compelling "opening," a "proposition" and a "close."

Putting in Personality —

The fellows who write letters telling us how to write letters always say, "Put personality and individuality in your efforts." Sure, but whose personality and individuality? Why, that of the man who is supposed to be writing the letter, of course! Simple, isn't it? And yet that apparently trite statement about personality and individuality which has been accepted without question throughout the ages has ruined more otherwise promising letters than any one thing, because it is absolutely wrong. The



"We are happy to tell you that we have in stock—" Such a beginning is likely to bring the letter to an untimely end—in the waste basket. The housewife is a person with troubles of her own and she doesn't care whether you are happy or not. It is only by touching her needs and problems that you will get your letter read.

good letter breathes not a single bit of the personality or individuality of the writer, but is full of that of the person who receives it. You see, you write in the other fellow's personality—not your own.

If you are careful in your violations of the moral code the community in which you reside doesn't care very much about you and to the recipient of your letter you are merely one of several hundred—or thousand—other units of the community, so when you talk about yourself you are discussing a very uninteresting subject and I, your listener, yawn politely behind my hand and right in the middle of your dissertation upon your merits break in by wondering if the price of meat is ever going to come down again, and privately I consider you very much of a bore; but if on the other hand your conversation has me as the central motive, I immediately marvel that I have not fully appreciated your wisdom and judgment heretofore.

A Household Fable —

The other Saturday night I was out rather late with a bunch of other statesmen who felt it best, once we were together, to settle a number of international problems which have been annoying the President and the Senate. We were full of enthusiasm and ardor, the room was comfortable and the waiters attentive. My watch had stopped and it wasn't until the police closed the place around 3 in the morning that I happened to remember that I had forgotten to go home. As I approached my domicile things appeared propitious; windows all

dark, and no reason in the world why I shouldn't get in quietly, and even in the dark I should be able to find my way to the bureau, and set back the clock thereon three or four hours before the light flashed up. I padded in on the lawn and was getting along nicely when I struck a bit of ice on the steps and came down with a crash that brought lights into the windows of all the neighbors' houses for a block each way. My wife came rushing out, solicitous and excited, and in a voice which caused doors to open in those homes where lights only had appeared before wanted to know if I were killed. In a perfectly calm, dignified manner I assured her that I was not only not killed but wasn't even injured, and if I could escape the severe frost would probably survive the winter. Instead of being overjoyed, as I of course expected, the lady of my house appeared somewhat disappointed and expressed it at length and with reiteration. I seemed to have forgotten the clock, but she hadn't. A couple of hours later our Airedale pup, who by strange coincidence also had had business out that night, came home and howled and scratched our new front door until the lady got up and let him in, I of course feigning sound slumber. One of the neighbors came over at an unreasonable hour to learn what all the commotion was about; also it appeared that I had neglected to remove my rubbers and it seems that muddy rubbers leave tracks on a carpet. There are a lot of things in domestic affairs which are of no concern to the public. Suffice it to say that things went as well as could be expected until my wife opened a letter which had come for her, and then she started talking to herself. After a not too brief recital of the events of the night before she said:

"Here I've been hard at work for four hours before any of the rest of the family are about. I've washed dishes and cooked breakfast, and baked bread and swept and dusted, and then I get a letter from Spinks & Duffie starting off, 'We are happy to announce that we have just received a new stock of,' etc. What in the world do I care to know how happy Spinks & Duffie are or what makes them happy? Happy,—why, I don't suppose I will ever know what the word means again," and she tore up the communication viciously. "And I don't care whether they have a new stock of goods, either, nor whether their store cat has kittens, or anything else about them," and her emotions overcoming her, she arose from the table and left the room.

On Beginning —

And inadvertently the lady told us what to do and what not to do regarding that first paragraph. First, we are not to talk of Ourselves, and in applying the second discovery we would start something like this:

Dear Mrs. Jones:

After you have washed the breakfast dishes, and made up the beds, and have placed the roast in the oven and scoured the kitchen sink, and have wiped off the pantry shelves and run up and down the cellar steps a half-dozen times, you are ready to begin the most disagreeable work of the day—sweeping those heavy carpets and dusting the furniture afterward, etc.; etc.

And some variation of the above, in accordance with

the domestic or business problems of the woman or man you propose to appeal to, will apparently answer the requirement of arresting attention and also of injecting personality and individuality into your letter.

If your mail contains a letter which recites a number of the irritating and tiresome incidents of that very morning your attention is won immediately and the writer has gained your sympathetic interest in whatever he may propose. He has written **your** personality into it. We are always convinced of the infinite wisdom of the man who tells us something we already know. We do not stop to think that what he has told us and what has happened to us that day also happened to every other business man in our particular line.

In the above instance it is obvious that a suction cleaner is the "proposition" and in a paragraph devoted to it we will say less about the cleaner itself than to show how the drudgery of the broom and the dust-cloth may be readily transformed into a pleasant, quickly performed incident.

One thing about this type of opening paragraph to which we must accord due importance is that it tends to create dissatisfaction with present conditions in the minds of those who receive it and dissatisfaction is the great buying motive always.

The Meat of the Matter —

Having created the desire of ownership, we now come to the real test: Will he be able to whip her brain into action; in other words, to rearrange her financial affairs so she may spare the money, or as a preliminary to make the physical effort necessary to come down to our shop and witness a demonstration—to have the handle of the suction cleaner placed in her hands? And yet if we did not succeed in that we have failed the purpose of our letter.

There are several ways in which this may be accomplished. One is to offer a cash discount, or a special price for a certain very limited time, thus urging that quick action will be necessary to avail herself of your offer; still another is by giving a premium; or you may offer special installment terms. These should be avoided if possible. The best climax—but unfortunately the one requiring the most skill—is to emphasize the inconvenience and drudgery which must continue to be endured until the woman shall enter into possession of one of our cleaners and to convincingly assert that this delay is a useless sacrifice of energy.

If we are selling Mazda lamps in a community wherein many carbon lamps are still in use perhaps we will start our letter thus:

"We have a fine stock of Mazda lamps on hand which we are offering our customers. These lamps will give twice the amount of light for the same money as your old ones."

I say perhaps we will begin in that manner; but let us hope instead that we will start something like this:

"I can save you from \$2 to \$4 per month on your electric light bill."

More people are interested in a definite money saving than they are in the æsthetic side of home illumination.

Ideas from the Northwest

(Some of the ideas in store arrangement and selling kinks which contractor-dealers in the Northwest have worked out. Here are suggestions from Salem, Ore., Spokane, Wash., and Vancouver, B. C.—The Editor.)

A SPECIAL FIXTURE DEPARTMENT is a feature of the store plan of the Salem Electric Company of Salem, Oregon. Fixtures are one of the hardest types of material to handle effectively in store arrangement, particularly because they do not mix well in a display with electric irons or electric washing machines and like appliances. To avoid this

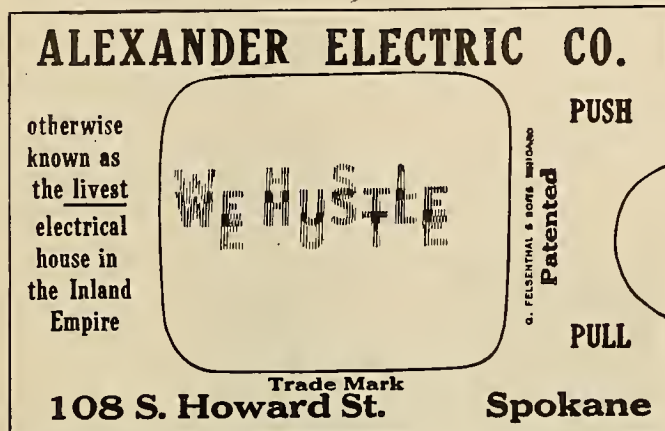


The fixture room has a window of its own which gives effective display to one or two special lamps and offers a vista of the attractive stock within.

difficulty they are usually placed in a dark corner at the back of the store where they may be displayed to persons inquiring. This, of course, has its objections, for the strong advertising value of attractive fixtures is not taken advantage of—and the possibilities of an effective night time display visible from the street must be given up. The store of the Salem Electric Company has the distinct advantage of a corner location which permits the segregation of the fixtures into one department and at the same time, the proper and attractive display of the goods. The rear of the store is partitioned off and made into a fixture room which, however, has a window of its own, always attractively decorated with its own wares. The view shown is a night time picture of this display which shows how readily visible the interior is from the street.

RENTING LEADS TO SELLING in many cases—in electrical appliances as well as in real estate. The application of this principle was what has led one Oregon dealer to rent vacuum cleaners at the nominal charge of seventy-five cents a day. He does this for but two months of each year—March and April. May first he announces the end of the rental period and recalls all cleaners that are out. He states that it is surprising how many sales are made to people who do not want to give cleaners up after having once used them. If the purchaser desires, time payments are accepted and many cleaners are sold in this way.

THE STORE WITH THE MOTTO—is the way the citizens of Spokane have come to think of the Alexander Electric Company of that city. "W E H U S T L E" in galloping letters has come to mean this store. The sign is in the front of

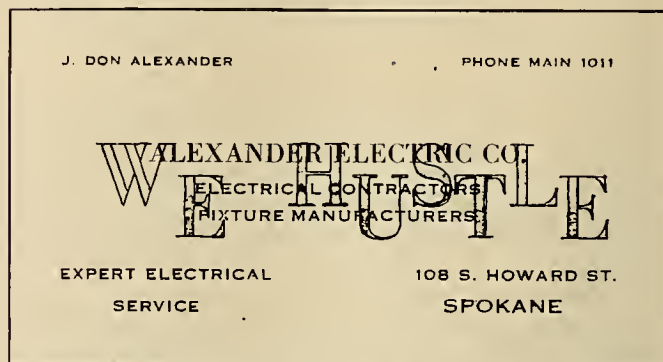


A novelty which is very popular with the children of customers—and even with the grown ups and which brings the idea of the motto home. By pushing the little interior card in and out of the envelope under a celluloid window pane, the letters are ingeniously made to "gallop."

each of their show windows, and is operated by means of a main shaft and eccentrics. A small motor furnishes the power necessary to keep the letters dancing for twenty-four hours a day. The result is that every person coming within visible range of this window carries away a definite association of the sign with electrical service and an eagerness to give the best service possible.

That the value of advertising is enhanced by repetition is a belief of Mr. Alexander, as is shown

Name plates on all apparatus and equipment leaving the shop. Sign incorporated on check protector. Even the shop bicycle has its sign attached.



The letters are stamped in blue outline on cards and stationery and are incorporated in the check protector

The boys of the vicinity are energetic boosters through the medium of small memorandum books distributed to those coming to the store after them. The little optical illusion dodgers, with their dancing letters, are also favorites with the boys.

The hustling sign has proven such a valuable feature to this up-to-date electrical store that steps have been taken to have it registered and protected.

THE HUMAN INTEREST is supplied in this window of the Electric Supply and Contracting Company, Ltd., of Vancouver, B. C., by a wax lady who sits in a chair with a brightly colored cushion loaned by a furniture store. The display is one of reading lamps, of course—and there is just the touch of humor in the card which reads "This Lady's Eyes

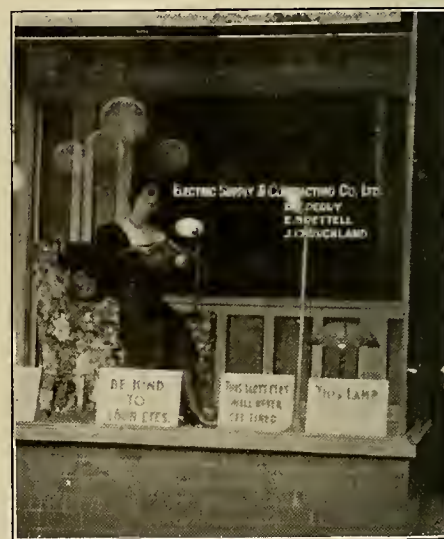


The motto is most prominent in the windows of the store where the letters are operated by means of a main shaft and eccentrics. This motto is used on bill heads and on the shop bicycle. In order to keep it before the eyes of customers, it is made part of a nameplate which is attached to all apparatus and equipment leaving the shop.

by the numerous ways in which his sign is placed before the public. The familiar letters appear

On memo books and optical delusion toys distributed to customers.
Outline letters on company stationery.
Outline letters on business cards.
Bill heads.

A wax lady is here effectively advertising a reading lamp. The chair with its bright colored cushions is loaned by a furniture store which is glad of the additional advertisement. The bubbles above the lady's head are not dreams, but the reflection of the street lamp.



Will Never Get Tired" to relieve the idea of any stiffness. The window as a whole is very simple and very attractive with several excellent features. One idea is presented and driven home. Signs are effectively used to tell the story—the sort of signs which will be read and remembered. The background in simulation of a home interior is not overdone by any attempt to attract attention to itself and yet charmingly suggests the desired effect. The opportunity of cooperation with dealers in other lines such as plumbing or furniture, by borrowing and lending properties, opens up an opportunity for a pleasant variety of backgrounds and most effective window displays.

EXAMINATION FOR SUPERVISING ELECTRICIAN

(Questions and problems of the Supervising Electrician's examination held during February in Portland. This examination is required of all contractors or others who supervise electrical work in the city of Portland. Try them and see how you come out.—The Editor.)

Practical Questions

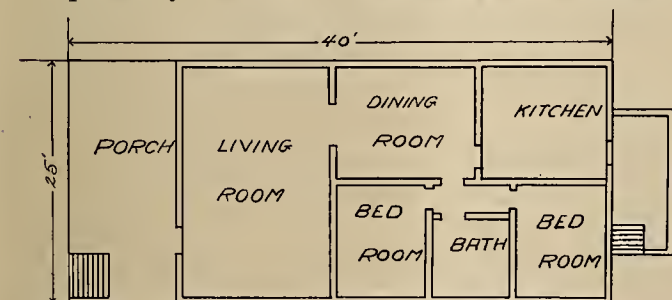
which counts twenty-two points.

1. (a) Bend a "goose neck" in conduit according to sample.
(b) Bend an offset in conduit according to sample.
2. (a) Connect up heater switch.
(b) Wire in a set of three and four-way switches.
3. (A) Wire up a shunt wound motor to a rheostat.
(B) Reverse the rotation of the motor.
4. Hang a combination gas and electric fixture.
5. Solder lugs on stranded wire.

Questions on the City of Portland's Electrical Code

Note: Each question counts two points, except Question 10, which counts twenty-two points.

1. How must the conductors from a generator to a switchboard be run to conform to the Code?
2. What protection must be provided to properly protect constant potential generators?
3. Do bus bars have to be always insulated? On what basis per square inch of cross section must they be figured to conform to the Code?
4. State whether or not lighting arresters are required by the Code on residence service wires?



I—Mark Portland Electric Code symbols as follows:

Porch—2 center lights on flush switch.
Living room—1-4 light fixtures and electrolier switch.
Bed room—1 cord drop, 1 snap switch (each).
Dining room—1-3 light fixtures, 1 flush switch.
Bath—1-2 brackets.
Kitchen—1-2 gas and electric fixtures, 1 snap switch.
Kitchen—1 iron plug on wall.
Living room—2 floor plugs.
Dining room—2 base plugs.
Kitchen—1 electric range outlet.

II—Mark on plans allowable wattage for each outlet.

III—Give list of material and approximate quantities, needed to completely wire the above job.

5. State the maximum percentages of the full load current of a 3-phase induction motor that may be used for "starting" and "running" fuses,
6. By what must each motor and its starting device be protected and controlled to conform to the Code?
7. State whether or not the neutral wire of the direct current three-wire system must be grounded?
8. Name and describe three kinds of insulation on wire that is most commonly met with in everyday wiring practice?
9. Does the Code allow Oil Transformers to be placed inside of ordinary store buildings?

10. Blue print.

Problems

Note: Each question counts three points, except Question No. 5, which counts eight points.

1. Calculate the size of wires to be used for the following motors:
One 10 h.p. 220 volt, 85 per cent efficiency, direct current.
One 5 h.p. 110 volt, 80 per cent efficiency, 3-phase, 60 cycle induction motor.
2. In a three wire, direct current system, with thirty $\frac{1}{2}$ ampere incandescent lamps between the neutral and the positive side, and sixty $\frac{1}{2}$ ampere incandescent lamps between the neutral and the negative side, how many amperes will be flowing in the neutral when all the lamps are burning?
3. How many 10-watts, 11 volts lamps in a sign using 909 amperes?
4. What size of rubber covered wire in conduit should be used to conform to the requirements of the city Code with an allowable drop to the farthest lamp of 2 volts,—the load consists of 42 incandescent lamps, which take 1 ampere each, distance 90 feet on a single phase, two-wire system?
5. Given ten circuits of 10-40 watt lamps (each),
" " " 20 amperes for electrical heaters (each), 110v.,
2—5 h.p., 230 volt d.c. motors.

All to be connected to a three wire, direct current system, with individual circuits to be run from one center of distribution. Specify the following:

- (A) Minimum capacity of main service feeders in amperes.
- (B) Minimum capacity of sub-feeders in amperes, for each circuit of lights.
- (C) Minimum capacity in amperes for sub-feeders for heaters.
- (D) Minimum capacity in amperes for sub-feeders for each circuit of motors.
- (E) Draw a diagram showing the best and the most economical arrangement of main service feeders and each sub-feeder for the individual devices and motors specified, marking the proper size of rubber covered wire B. & S. gauge on the diagram.

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule X. Changes in or additions to contract plans or specifications shall be made the subject of estimate or shall be based on the time and materials involved.

ORDER AND SYSTEM IN YOUR BUSINESS

(The Journal of Electricity announces that a series of articles on The Business Library, written by Louise B. Krause, librarian of H. M. Byllesby & Company, Chicago, Ill., will begin in the issue of April first. Miss Krause has recently completed a four weeks' lecture period on the subject at the Riverside Library Service School, Riverside, California, based on her observations and experiences as a business librarian during the past ten years.—The Editor.)

Does your desk ever become crowded? What do you do with your important catalogs and statistical data? How about photos—and especially your maps and blue prints? Do they await your service in orderly, easily accessible arrangement or do all these things picture to you a household of despair? The Journal of Electricity has appealed to the best talent in the United States to assist in giving to our readers just what is needed on this subject. Think of the great Byllesby Company, what it today means for order, system and efficiency.

Miss Louise Krause, the pioneer and today the head of the new idea for systematic order in business routine, officially known to the Byllesby Company as their business librarian, is to be the author of a series of articles that will sell to you the library idea in business in the same way that the "electrical idea" has been sold to the public as an indispensable factor in modern life. The "library idea" does not include any preconceived picture of dingy shelves, of books you may some day read at your leisure, but it means an idea that when sold to you will teach you order and system in your business routine—an indispensable part of your daily life.

In order to learn the attitude of business men and libraries as to the need and value of this series, letters were written to leaders in the work throughout the country asking advice and criticism. How vital this subject is to business men may be judged from some of the replies received from big concerns which have established libraries of their own and from the public libraries themselves.

George B. Utley, Executive Secretary of the American Library Association, writes:

I am glad to know that you are to issue in your Journal the series of articles by Louise B. Krause on "The Business Library," which she has delivered recently at the library school of the Riverside Public Library. Miss Krause is a woman of library training and experience, has been for several years librarian of the H. M. Byllesby Company, of Chicago, and is thoroughly acquainted with the subject of which she treats. In looking about for the most suit-

able person to deliver this series of lectures, Joseph F. Daniels, the librarian of Riverside, very logically selected Miss Krause as one of the country's leading exponents of the practical value of a professional library to a business house, and the distance of Chicago from Riverside did not deter him from obtaining her services.

Ten years ago it was something of an innovation for a business house to install a library and employ a trained expert librarian. Now it is considered quite the proper thing. Then it would have been counted a luxury; now it is regarded a necessity. A business library is to its house a bureau of information to which the officers and employees turn for facts, whether they concern a matter of policy wanted by the president, or the best way to ship goods to Timbuctoo, wanted by the shipping clerk.

But notwithstanding its proved worth, some business houses are not yet availing themselves of the service of a library; in some cases due to ignorance of what library service means; in other cases because they think they can not afford it. Miss Krause will, I think, show what a library is worth in dollars and cents, and her articles will, I hope, be read by some who have never given the subject the attention that for their own interest and profit it deserves.

Furthermore, some business men are woefully slow in getting out of their public library all the service to which they are entitled. Some business houses are too small to afford a full-fledged business library, but no business man can afford not to use his public library,—if he doesn't he is paying for something he is not getting any benefit from. Every public library that is worth what the public is paying for it, makes particular effort to acquaint business men how it can help them in their business, and if a public library does not

have what the average business man needs, not only in books, periodicals and other ephemeral matter, but in service as well, it is the duty of the public-spirited business man to investigate the reason why.

Miss Krause's articles will doubtless tell a business man how he can get the best use out of his public library, as well as out of a specialized private library, and I sincerely hope this series will reach a wide circle of business and professional men.

GEORGE B. UTLEY,

Sec'y American Library Ass'n.

Edward D. Tweedell, Assistant Librarian of the John Crerar Library, in Chicago, writes:

I am glad your readers are to have the benefit of the articles on "Business Libraries" by Miss Louise B. Krause. Knowing Miss Krause personally and also having an intimate knowledge of what she is accomplishing in her own business library, I feel sure there is no one better qualified to write such a series.

Business men are beginning to realize more and more that books have something vital to contribute to the success of their undertakings. The experience of others in certain lines may be very helpful, in avoiding mis-

THE BUSINESS LIBRARY

The series of articles on "The Business Library" shortly to appear in the Journal of Electricity will give helpful suggestions to the business man who already has established library service within his organization, or who is considering the possible value of inaugurating such service.

It will tell the small business office, in detail, how to procure, catalog and file information without the aid of a trained librarian, and will suggest information of value to be found in public libraries, which are invaluable aids both to the individual business man and to organized business libraries.

It will give to public librarians a more intimate knowledge of the business man's point of view and his growing demands for quick service and up to date information.

The following topics will be treated in a series of twelve articles:

The organization and purpose of the business library.
Special sources of information for the business man—how to acquire, how to use and how to file them.

Periodicals
Government documents
Trade catalogs
Photographs
Lantern slides
Reference books

The classification, cataloging and filing of business information.

Mechanical equipment and supplies.

The librarian's essential qualifications for success in business library work.

takes, saving expense, and increasing the success of the enterprise.

A business library deals not only with the buying, selling and accounting end, but with the manufacturing, the raw materials, new projects, in fact, furnishes information of value, all the way from the spelling of a word to helpful knowledge in matters of policy and future development.

These articles will show the business man what the library can do for him, and will show the librarian how the results can best be obtained. Miss Krause as a successful pioneer in this line writes with abundant knowledge and authority

E. W. TWEDELL.

W. H. Cameron, Manager of Industrial Relations of the Eastman Kodak Company, gives us the strictly business point of view:

I have the highest respect for the experience, ability and point of view of Miss Louise B. Krause. I have consulted her freely during the past five years while organizing and promoting the business library of the National Safety Council at Chicago.

In my opinion, Miss Krause is one of our national experts upon the theory and practice of making business libraries effective, and it seems to me that the series of articles referred to in your letter should be of great value to your readers. I know that I would personally be much interested in reading the series myself, and I know that the executives of industries interested in establishing business libraries would be interested in the practical advice Miss Krause would give in the proposed series of articles.

I cannot use superlatives that in my opinion would praise too highly Miss Krause's work and experience in the building and management of business libraries.

W. H. CAMERON,
Manager, Industrial Relations.

Representative of the western attitude is the letter of **Everett R. Perry, librarian of the Los Angeles Public Library:**

Your letter of January 24th relates to a subject to which I have given much consideration. Business libraries have existed in the East for some time, especially in New York and Chicago, and they undoubtedly render a most valuable service to the firms which have established them. On the Pacific Coast we apparently have been a little slow in adopting the idea. There is no question that your main contention is well founded. The business man of most communities has no adequate realization of the aid that he may secure from his public library or from a business library.

I think you are safe in printing any series of articles that Miss Krause writes. Her reputation as a business librarian is very high. She thoroughly understands the scope of business libraries, of the need of which most librarians are now convinced, though with some regret, I fear, that public libraries cannot command sufficiently large funds to enable them to provide the service down to the fine point which should be possible in a good business library.

I thank you for calling the series of articles to my attention, and I shall read them all.

EVERETT R. PERRY.

There is space for only a line here and there, to show the general attitude of other librarians:

"If business men who do not feel that they can establish a technical library of their own would get the library habit, or even the library telephone habit, it would mean dollars and cents to them."

"I have felt that a very large number of business men do not realize what they are missing when they do not use the resources of the library, particularly of a library that makes a special point of collecting and exploiting business literature. If you can find some way of promoting this end, you certainly will render a great service."

"The plan for a series of articles on Library Service for the Business Man is an admirable one and deserving of the best you can get in the way of material and of the utmost publicity in bringing it to the notice of business men."

"If you can get the business man to see the value of the library in relation to him, the library will still further increase its service with the growing demand."

"The libraries are beginning to be known as necessities rather than luxuries. Wide-awake business men realize that they cannot keep abreast of the times without the aid of the library."

SAVING THE WASTE IN THE CHIMNEY—V.

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Correspondence from many quarters has come into the Journal of Electricity relative to the series of articles on "Fuel Oil and Steam Engineering" which in recent months has appeared in book form. The authors herewith publish five of the questions that have been asked as they doubtless may prove of general interest.—The Editor.)

Questions Answered on Fuel Oil Economy

Question 1. What is the approximate increase, if any, in boiler repairs when coal fired boilers are changed to oil?

Answer: The amount of boiler repairs is practically the same when burning oil as when burning coal, provided the boilers are operated at the same capacity and the oil burners are properly adjusted so as not to blow oil direct against the boiler tubes or direct against the brick walls.

Question 2. Is the back shot method the best for Stirling boilers?

Answer: The back shot oil burner is generally considered the best for Stirling boilers, owing to the advantage gained by the large combustion chamber.

Question 3. Can you give the comparative costs, per 1000 pounds of steam, of coal vs. oil, including all boiler room costs? In this question I have in mind modern firing facilities. Give the unit prices for both coal and oil.

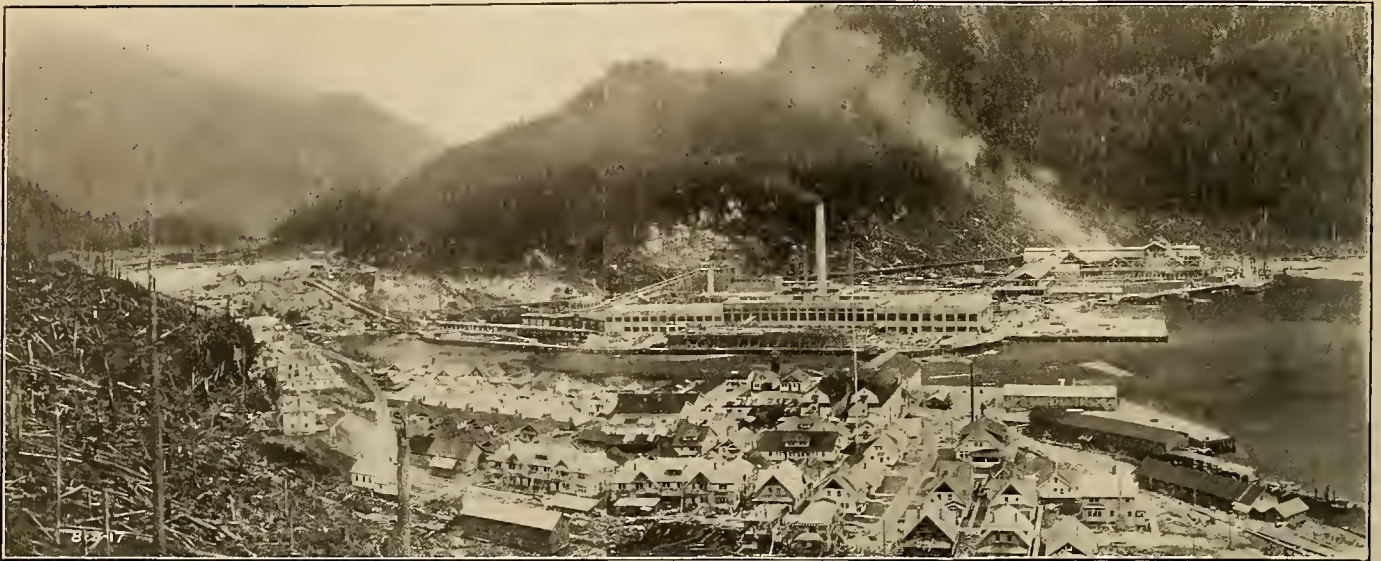
Answer: In regard to the comparative costs of oil vs. coal the reader is referred to a diagram by one of the authors that was published in the Journal of the American Society of Mechanical Engineers, Vol. 40, No. 7, Part II, July, 1918, on which the relative value of oil is plotted against coal of various qualities. From this diagram the reader can see at a glance, for instance, that oil costing \$1.50 per bbl. is equivalent to coal of 10,000 B.t.u.'s costing \$3.50 per short ton or coal of 14,000 B.t.u.'s costing \$6.00 per short ton.

Question 4. What quantity of oil have you found by actual tests is necessary to evaporate the same quantity of water as 1 ton (2240 lbs.) of coal, giving B.t.u.'s in coal and oil?

Answer: The quantity of oil necessary to evaporate the same quantity of water as one ton of coal depends entirely on the heating value of the two fuels and the boiler efficiency obtained. If the heating value of coal is 14,000 B.t.u.'s and the boiler efficiency is 72%, each pound of coal would evaporate 10.35 lbs. of water from and at 212°. One pound of oil containing 18,000 B.t.u.'s with a boiler efficiency of 78% would evaporate 14.4 pounds of water from and at 212°. From this you can readily figure out that one ton of coal containing 2240 lbs. would evaporate the same quantity of water as 4.8 bbls. of oil each containing 336 pounds.

Question 5. Have you found mechanical atomizing to be the most economical?

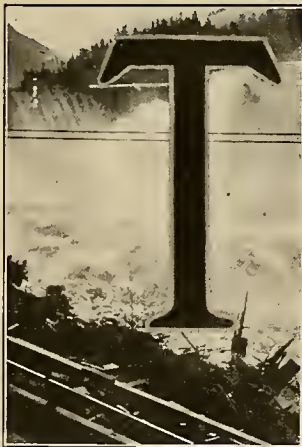
Answer: Oil is atomized by steam in nearly all stationary boiler plants due to the fact that steam is more convenient than any other method, and the atomization is very perfect. As a rule mechanical atomization is not used unless the loss of fresh water used in steam atomization is an important consideration.



Raw materials, saw mill, factory, reservoir, power plant and shipping facilities are all within a few hundred yards

MAKING PAPER BY ELECTRICITY

(A reservoir, penstock and power plant all within a few hundred yards, and what is more, the factory utilizing the power, the raw materials and the shipping facilities immediately adjacent—are typical of the unique possibilities in the West for the development of power to meet the needs of individual industry. The special requirements of the paper industry for uniform speed further bring the necessity for adjustments of peculiar interest to the power man.—The Editor.



At flood periods, a maximum of 12,000 cu. ft. per sec. is discharged over the spillway.

THE Ocean Mills Plant of the Pacific Mills, Ltd., is an interesting and unique instance of a compact installation peculiarly convenient to meet the needs of the paper industry. The plant is located some 350 miles north of Vancouver in the midst of the Canadian forests. Thus it becomes possible for the factory to be brought close to the source of raw materials and a fortunate fall in the river at this point

concrete building provided with 2 Francis turbines and a Pelton water wheel with a combined capacity of 8,850 h.p. There are two 60 cycle, 2200 v. generators of 1850 kva., 225 r.p.m. and one of 3750 kva., 360 r.p.m. direct connected. Power house No. 2 is used as a standby plant with three 600 kw. wicket gate inward flow turbines directly connected to three 60 cycle, 600 kw. generators at 440 volts. The turbines in No. 1 are controlled by Woodward governors and by type P Lombard governors in No. 2. Power house No. 1 delivering 2200 v. and Power house No. 2 delivering 440 v. are tied together with tie lines and transformers.

Motors in Use

There are about 200 motors in use throughout the plant ranging in size from 10 h.p. to 725 h.p. The majority are squirrel-cage induction motors; there are also several round rotor motors, some equipped with brush lifting device, also a number of d.c. motors on cranes, monorails, etc., three being located in the roll grinder where the rolls of the paper machines are re-ground.

The d.c. motor and generator used in connection with the paper machines has a Westinghouse panel board containing the necessary relays and switches. Provision has been made for starting, stopping and changing speeds at a convenient place in the paper-machine room, the sets being located on the floor below.

For driving the paper machine, speed regulation is very essential as any change in speed will vary the weight or thickness of the paper and is very apt to cause a break, which is a very serious interruption in the output of paper.

provides power immediately at hand.

A dam across the stream of 53 ft. in height has formed a lake which varies from 8.45 sq. mi. to 9.18 sq. mi. at high water. A log chute gate is provided 10 ft. 10 in. by 9 ft. 8 in. of wood with metal bearing strips of $\frac{3}{8}$ in. iron. Discharge openings are located at the bottom and hand operated, although motor operation can be installed. At flood periods, a maximum of 12,000 cu. ft. per sec. is discharged over the spillway.

The Power Equipment

Two power plants generate the electricity which operates the machinery of the saw mill and paper mill. These are fed by two penstocks of 966 ft. and 549 ft. respectively which deliver the water under a head of 130 ft. Power house No. 1 is a reinforced

The Process of Paper Making

The majority of raw material used in making paper today enters the paper mill in the form of mechanical or chemical fibre, which is produced from timber entering the mill as logs or cordwood. If the



A log chute carries down the logs which are imprisoned by the dam. This is closed by a gate the top of which is just visible in the picture.

cordwood is not previously barked in the woods it is run through barkers, after first being sawed and split into suitable sizes for handling. These barkers remove all bark and leave the wood in shape for the first step in the manufacture of paper.

Passing from the barkers the wood is conveyed part to the chipper building where it is chipped in sizes suitable for digesting, and part to the grinder room where it is ground into "ground-wood." The chips pass from the chipper building into large storage bins where they are fed by gravity into large metal tanks lined with cement oil acid proof brick and through the agency of sulphurous acid and steam are cooked or digested for a period of seven to twenty-four hours depending on the grade of sulphite required; from thence the sulphite is blown, using the steam pressure of 110 lbs. required in cooking, to large receiving tanks called "blow tanks," where it is washed clean of all acid.

Another portion of the chips is fed by gravity into rotating metal tanks of smaller size which contain the sulphate liquor under steam pressure and this is likewise cooked from $2\frac{1}{2}$ to 6 hours, depending on the grade required. When cooked the resulting pulp is blown into washing tanks, which leaves the clean pulp required.

The sulphite is used in news print and the sulphate for making wrapping paper of unusual strength. The trade name for the latter is "Kraft."

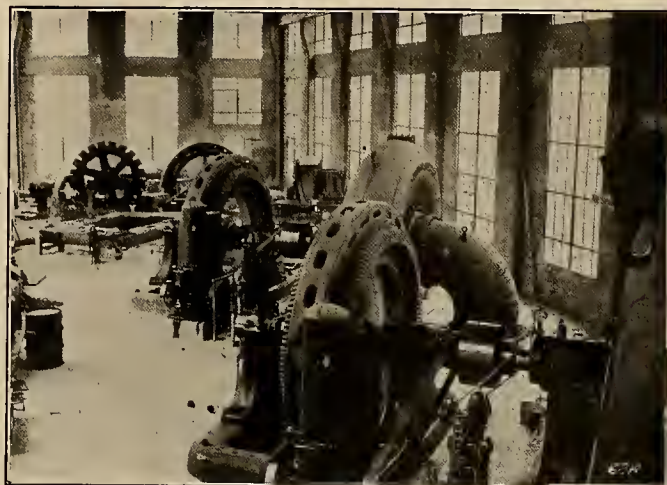
The blocks that go to the grinder room are placed into pockets of the grinder and by hydraulic pressure are pressed against fast revolving stones about 54 inches in diameter which separate the small fibres of the wood. This wood is then pumped into storage chests for further manipulation.

As the sulphite and ground wood are used in the process of making news print we will follow these through briefly to the machines. The ground wood is pumped from the storage chest to a screen which

recovers the coarse fibres; from thence to the Deckers which removes about $\frac{6}{7}$ of the water, and from thence to a ground wood chest which is drawn in as required before pumping to the Beaters.

The sulphite is pumped from the blow tanks to the unscreened sulphite chests, from thence to the "Knotter," from the Knotter to the "Slushers," a machine which screens out the usable sulphite, and from the Slushers to the screened chests and thence to the Beaters as required.

The Beaters mix the ground wood and sulphite in proper proportions and here the size analine, alum and other ingredients may be added. The Beaters



The power house in process of construction. 8850 h.p. are generated in the larger of the power houses and meets all regular needs, power house No. 2 being used as an auxiliary plant.

both mix and further refine the fibres. From the Beaters the pulp passes to another storage chest from which it is pumped through the Jordan for further refinement to another storage chest. From these chests it is pumped to the Voight screens, thence to the floor box and thence into the "wire," a fine mesh bronze screen which is endless and carries the pulp to the rolls. The majority of the water is removed when on the screens and the paper which is now taking form is conveyed in a woolen felt through three sets of press rolls, leaving which it passes over a series of hot rolls which dry the paper. Finally it passes through the calendars, a stack of heavy chilled iron rollers one above the other, giving the paper finish, whence it passes to the winder where it is rolled into large rolls. The large rolls are passed into the finishing room where they are re-wound into rolls, the size of which depends on the size required for marketing.

The sulphate or kraft paper closely parallels the making of newsprint except that there is no ground wood mixed with the sulphite, it passing on to the machine wire after a series of refinements only. The finished kraft is brownish in color and remarkably tough.

After rewinding the rolls of both news print and kraft in the finishing room they are carefully weighed and wrapped and are then taken to the large paper warehouse to await shipment. About 225 tons of paper a day are produced at Ocean Falls.

AN ELECTRICALLY DRIVEN FILTER

BY E. J. RICHARDS

(A brief description of one of the many applications of electricity to the mining industry. The Oliver filter which is a western invention, is of special interest as one of the factors which has helped to revolutionize mining practice by making the flotation process possible. The author was formerly chief electrical engineer with the Arizona Hercules Copper Company and in charge of the construction and operation of this plant.—The Editor.)

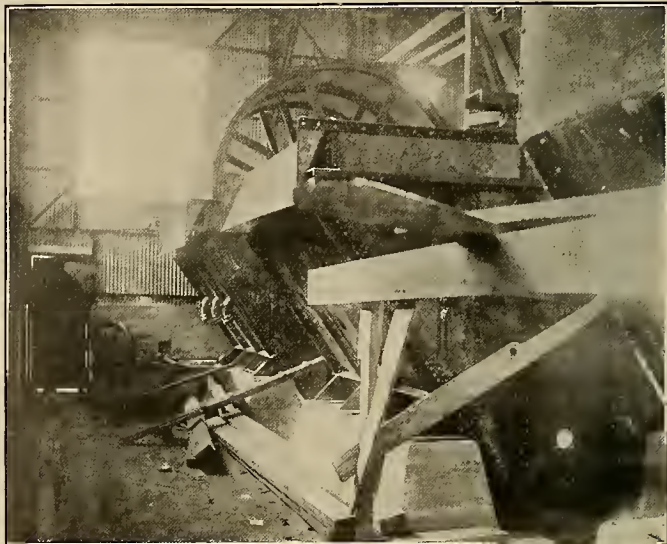
An electrically driven filter plant using the Oliver continuous filter system is used by the Arizona Hercules Copper Company at their concentrating mill near Kelvin, Arizona.

The filter equipment is housed in a steel frame corrugated iron covered building located below and a short distance from the mill building, permitting the pulp to flow by gravity to the various settling tanks and main pulp storage tank. This storage tank is of concrete construction located at the south end of the building, the pulp being elevated to the filters by a bucket conveyor.

Three 12 ft. by 8 ft. filters manufactured by the Oliver Continuous Filter Company of San Francisco, are installed with the necessary auxiliary equipment. This consists of vacuum pumps, in duplicate, for extracting the surplus water from the pulp; necessary centrifugal pumps with storage tanks for returning this water to the mill tanks; air compressors for forcing the partially dried pulp from the filter canvas together with necessary shafting, pulleys, belting, etc.

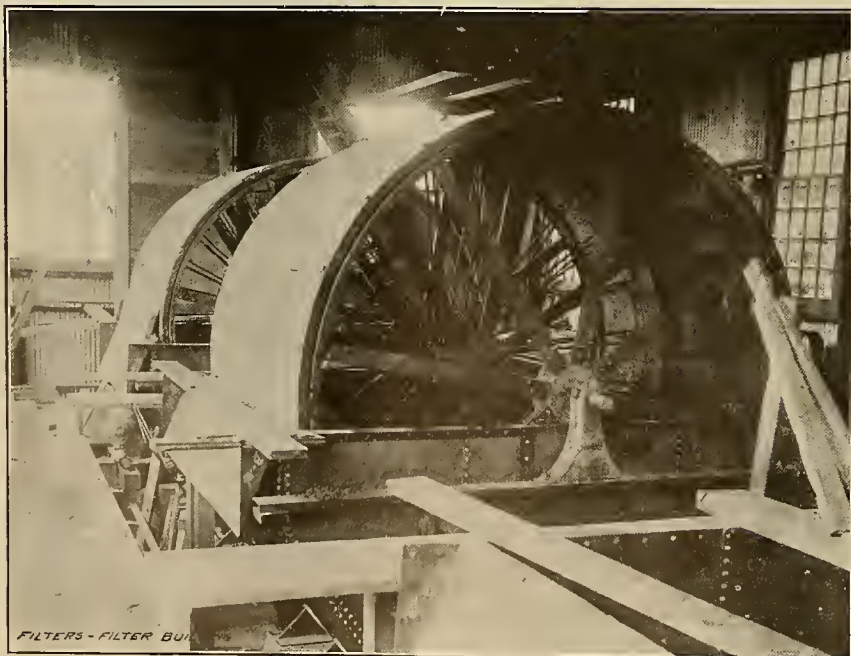
The operation of this filter possesses many features of interest. The filter consists of a drum, clearly shown in the cut, the surface of which is covered with canvas held slightly distant from the drum by narrow wooden slats or bridges spaced about 1 inch apart around the surface of the drum. This forms an air space of approximately $\frac{3}{4}$ inch between the drum and the canvas and this air space is connected by radial pipes to a communicating valve on one end of the shaft. This valve is connected, by piping, to the vacuum and pressure pumps and the slow revolution of the drum auto-

matically connects part of this piping to the vacuum system and part to the pressure system. About $\frac{3}{4}$ to $\frac{7}{8}$ of the surface is under vacuum and slowly



The filter being installed. About $\frac{3}{4}$ to $\frac{7}{8}$ of the surface of the drum is under vacuum, the remainder under pressure. This alternately sucks up the concentrate and then, at the proper point, lets it fall again on to a belt conveyor.

sucks the pulp onto the surface of the canvas, gradually building up a layer of concentrates about $\frac{1}{4}$ to $\frac{3}{8}$ of an inch in thickness and absorbing the water and moisture from same during its travel. For the last $\frac{1}{8}$ to $\frac{1}{4}$ of the revolution the pipes—and surface of the canvas—are subjected to air pressure which gradually loosens the partially dried pulp or cake from the canvas and allows it to be scraped off by the apron or cutting edge.



THE FILTER, READY FOR USE

In this interesting invention the concentrate is filtered from the liquid contained in the tank, in which the lower portion of the filter revolves, by a suction process. When the pulp, or ore, is thus deposited on the canvas, during another portion of the revolution of the drum it is blown out from the canvas and deposited in a receptacle designed for this purpose.

All of the above machinery is driven by a 50 horsepower 2300 volt motor located at the north end of the building and belted to the above mentioned line shaft.

In the building are also located 2 two stage centrifugal pumps each driven by a direct connected 25 horsepower 2300 volt motor used for pumping water from the settling tanks to the main mill storage tanks located above the mill, and from which the water flows again, by gravity, to the mill for grinding and flotation purposes.

From the aprons of the filters the partially dried pulp, in cakes, drops onto a 20 inch belt conveyor and is carried either to the concentrate bin or directly to cars for shipment to the smelter. This conveyor is driven by a $7\frac{1}{2}$ horsepower 440 volt motor.

These three filters are designed to handle the concentrate from the three sections of the mill, which has a capacity of handling from 1200 to 1500 tons of ore per day. The filter delivers the concentrate in a condition containing not more than 8 to 12% of moisture.

Since the appearance of the first article of the author entitled "Electric Generation by Diesel Engine" in the Journal of Electricity, February 15, 1919, inquiry has been made as to the list of manufacturers that had a part in furnishing the material for this installation, the first of its kind in the West. The following is a list of those furnishing the major materials and apparatus for the Arizona Hercules Copper Company connected with this work:

Steel Buildings and Tanks—El Paso Bridge & Iron Co., El Paso, Tex.
Power House Generators and Switchboard—General Electric Company.
Mill and Mine Motors—Westinghouse Electric & Manufacturing Co., General Electric Co., Wagner Electric Manufacturing Co.
High Tension Transformers—Wagner Electric Manufacturing Co.
Machine Shop Tools—Manning, Maxwell & Moore.
Gyrating Crusher—Allis-Chalmers Manufacturing Co., Milwaukee.
Shafting, Pulleys etc.—Dodge Manufacturing Co.
Steel Poles and Towers—Bates Expanded Steel Truss Co., Chicago.
Flotation Equipment—General Engineering Co., Denver.
Hoisting Ropes—A. Leschens Sons Co., San Francisco.
Marcy Mills—Mine & Smelter Supply Co., El Paso.
Filter Equipment—Oliver Continuous Filter Co., San Francisco.
Conveyor Equipment—Webster Manufacturing Co., Tiffin, Ohio.
Mine Hoist—Nordberg Manufacturing Co., Milwaukee, Wis.
Belting and Conveyor Belt—J. E. Robertson & Co., Mills Bldg., El Paso.
Compressor—Ingersoll-Rand Co., Los Angeles.
Motor Generator Sets—Westinghouse Electric & Manufacturing Co.
Centrifugal Pumps—Cameron Steam Pump Co., Los Angeles; Byron Jackson Iron Works Co., San Francisco; Krough Manufacturing Co., San Francisco.
Electric Locomotives—Westinghouse-Baldwin.
Diesel Engines and Auxiliaries—McIntosh & Seymour Corp., Auburn, N. Y. (Sheldon Bldg., San Francisco.)

RECENT MULTIPLE ARCH DAMS

BY JOHN S. EASTWOOD

(The multiple arch dam has made a distinct place for itself in water and water power development, as peculiarly fitted to meet the needs of certain locations. The following is a compilation of data on four of the most striking of this type of structure erected during the past two years. The author is the originator of the so-called Eastwood type of dam.—The Editor.)

Four dams of the Eastwood multiple-arched type have been built in San Diego county within the past two years which embody features of importance, in particular as showing comparisons of cost and other features of great interest to the engineering profession and to prospective builders of dams.

The limited space will not allow detailed descriptions, and as the type has become quite familiar,

The Murray Dam

The Murray dam, named in honor of the principal owner of the company, Mr. James A. Murray, was built by the Cuyamaca Water Company to increase the storage provided by the old La Mesa dam, which was the first hydraulic filled dam built in California. The old La Mesa dam was 65 feet high and created a storage basin in a dry wash debouching into the San Diego river, forming a distribution reservoir for the old San Diego Flume Company, later the Cuyamaca Water Company.

During the extreme floods in this vicinity in January, 1916, when the Lower Otay, a filled dam, went out with great loss of life and property, when the south dyke of the Sweetwater reservoir went out and the water cut around both ends of the single-arched masonry Sweetwater dam and was within six inches of taking out the Morena dam, a rock fill dam, the old La Mesa dam lacked only a foot of overtopping, and was only saved by the heroism of the attendant at the dam. The open spillway was insufficient to carry the excess waters from the local drainage while the sluice gate, a geared valve gate, was closed. The gate is located at the base of the dam and required a long time to open. Had the water overtopped the dam in even a small amount it would have been fatal to the dam, the attendant and much life as well as property in the wake of the flood. The danger was imminent and great, the act of staying to open the gate was heroic, the Scotch lady, Mrs. McQuarrie, who opened the gate amid the swirling waters, was a heroine, and deserves a medal for a heroic act.



THE LAKE HODGES DAM

The dam is 136 ft. high and 750 ft. long, with 25 buttresses and arches, besides the open spillway cut into the mountain side.

only an outline description of each is given, the interesting features of each being given, also some side lights on the comparative costs of structures for water storage that will interest all readers.

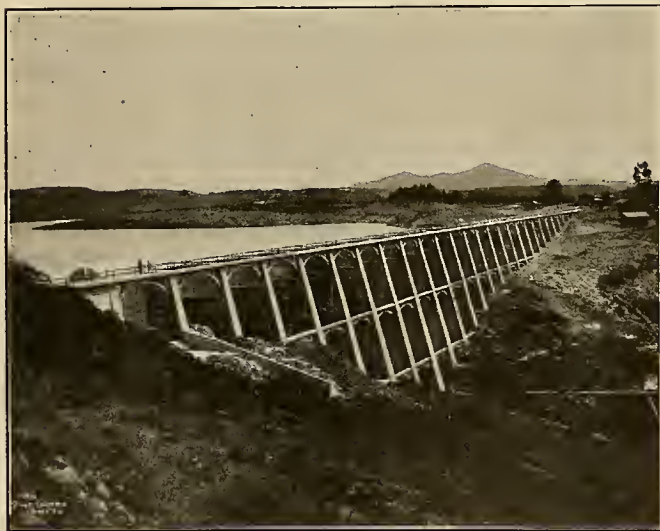
The old dam had sagged down in the middle, showing settlement due to undermining, and the danger of loss led to the building of the present Murray dam.

It was also planned to greatly increase the storage capacity and to make it a storage as well as distribution reservoir, so that the new dam was planned and built 35 feet higher than the old dam and even with the top of the ridge on the south end.

The dam is an Eastwood multiple-arched dam of a design to fit the conditions of shape and dimensions of opening with the highest efficiency. It consists of 30 arches of 30 foot span, is 117 feet high at the extreme point and 900 feet long overall. The slope of the front or arched water face is 1 to 1 or 45°, and the rear of the buttresses 28/100 to 1, being uniform from top to bottom, while the arch rings are provided with a 12 foot vertical head.

Heavy strut-tie beams, arch-supported, are provided for stiffening the buttresses, besides which there are counterfort buttresses or wings at the rear ends of the buttresses, the top beam being widened to four feet and provided with a railing for a foot walk over the entire length of the dam.

All strut-tie bears are heavily reinforced with steel rods, tied together, hooped and trussed in



THE MURRAY DAM

30 arches of 30 ft. span—900 ft. in length and 117 ft. high at the extreme point. This dam is designed to increase the storage of the old La Mesa dam which was threatened by the flood of January, 1916.

standard reinforcing methods for the purpose to be attained.

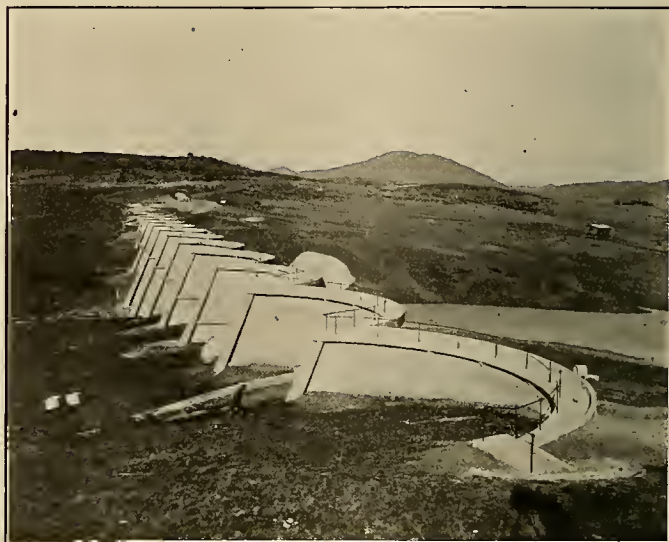
The tops of all arch rings are provided with a heavily reinforced cope on the front edge of which is placed a 12 in. wave cope, for the dam is planned to store to the level of the top of the cope and foot walk, in other words to be 100% efficient in storage capacity.

The stresses used throughout are 325 lb. per square inch or 23.4 tons per square foot. The arch rings are all heavily reinforced with steel rods tied to rods projecting from the buttresses, and the percentage is greatest at the top of the structure, the 9 inch vertical head having the greatest percentage of reinforcement.

A self-charging siphon spillway, having a capacity of over twice the flood inflow of the flood of 1916

is placed in the last bay on the north end of the dam and will regulate the level of the reservoir within 3 inches of the top of the main cope, the lip of the spillway being on the same level as the top of the cope, thus maintaining the storage capacity at 100% efficiency. The self-charging spillway is particularly adaptable to the multiple-arched type of dam for the reason that it requires very little in the way of additional walls and the openings are well shaped for the highest efficiency of inflow.

The dam is partly located on the porphyritic dyke that passes through this part of the country and partly on the old beach hardpan of cemented conglomerate, which occurs on the south end of the structure.



THE SAN DIEGUITO DAM

This dam was built in less than four months in spite of adverse labor conditions. It is 633 ft. long on the crest and 52 ft. high, with 13 buttresses and connecting arches.

All walls were taken down to sound rock and all foundations were passed by the engineering department of the State Railroad Commission of California, as well as by the writer, and the tightness of the dam and its foundations indicate the care used in getting good foundations. There is no sign of leakage through the walls of the dam where plastered, and a very small seepage through the bed rock.

The work was begun in April, 1917, and completed in January, 1918, taking seven months to build, and was put in service for the runoff of 1918, having water up to the base of the vertical head in February, 1918. The winter of 1917-18 was a very dry one and it was impossible to fill the reservoir to a height greater than 91 feet on the gage which was done within 30 days after the dam was completed.

In connection with the excavation of the foundations a very interesting feature was that as the room was scant, the new dam was placed as close to the downstream toe of the filled dam as possible, necessitating the cutting away of a part of the toe of the old for the upstream toe of the new dam, but no sooner had the top paving been removed, when the sandy material of the filled dam began to flow as quicksand into the space excavated, being in fact after all these years, merely the same quicksand

it was when placed. It being unsafe to continue the excavations for fear of losing the old dam and the water supply, the small excavations were back filled with rock to hold the sand from flowing, and the toe of the new dam was carried down vertically in timbered trenches, clear of the old dam.

The dam was designed by the writer, for the Cuyamaca Water Company of San Diego, which is owned by James A. Murray, Wm. G. Henshaw and Col. Ed. Fletcher, and was built by the Sharp and Fellows Contracting Company on a unit basis, under the direct charge of F. M. Faude and later under Mr. Bartl.

It is one of the most complete, economical, efficient and satisfactory dams of the many of this type designed and built by the writer.

It has a minimum safety factor of 10 or is 1000% strong, has stable equilibrium or balanced loading, has cost less than any dam of its size in the world, is at the same time five times as strong as a masonry dam, has been tested by service and the most severe earthquake in recent years, and has not a single crack in it.

The Eagles Nest Dam

The Eagles Nest dam is located in the hills above the Warner Hot Springs and was built to create a small fish pond and to hold a small amount of water for a lighting plant to be put in for the Hot Springs hotel and cottages.

When compared with other dams it is a small one but is of interest as being the first of its kind built, being what the writer designates as a Matilija or Butterfly dam, owing to its plan shape, and is in reality a triple-arched dam. It is not the first designed for one of this type was designed for the South Feather Land and Water Company by the writer.

It is the economical type for small openings, and in this case the opening is 125 feet wide and 38 feet deep, so the dam is designed to close the opening with the least material, the end arches being of 25 foot span each and the central arch having a span of 70 feet. The end arches have radii of 15 feet and the central arch 48 feet, giving it an arc of $93^{\circ} 40'$.

A cope three feet wide covers the tops of all arches and is supported by brackets. The south abutment is a granite rock and the north one is of concrete. Old cables were used for reinforcement and were laid in as the work progressed. As showing the economy of this refined design for the place, the total concrete is but 184 cubic yards, while the stress is only 267 lb. per square inch or 19.2 tons per square foot, showing that there is no need of mass for strength if the design is scientific.

The San Dieguito Dam

The San Dieguito dam is a part of the distribution works of the San Dieguito Mutual Water Company's system for irrigation of the lands of the San Dieguito Rancho and other lands along the coastal plain adjacent. It forms the distribution reservoir, enabling the delivery of the water to be stored in Lake Hodges dam to be distributed without interruption and with an efficient conduit system.

The structure is a multiple-arched dam, very much like the Hume Lake dam in size and design. It is 633 feet long on the crest, 52 feet high, and consists of 13 buttresses and connecting arches, the spans being 50 feet, the arc of the water face 120° . A cope 4 feet wide runs the full length of the arches and is provided with a hand rail, forming a foot walk across the dam. There are no strut-tie beams, the buttresses being stiffened by the use of counterfort buttresses of generous size.

A self-charging siphon spillway is provided having a large capacity to take care of any floods from the local drainage area when the reservoir is full. The lip of the spillway is even with the top of the cope, a wave cope giving it a 12 inch freeboard, and the structure will store to 100% efficiency.

The excess water that may come through the conduit is automatically spilled over the sides of a flume on the line, located in a rocky canyon so that at no time will the reservoir be filled higher than the spillway lip from the stored water.

This dam was built in less than four months by Bent Brothers, contractors, on a lump sum bid for the dam complete, and the remarkable thing was that they did it at a fair profit despite the worst kind of labor conditions for 79% of the lowest bid for an earth fill for the same site with all the earth at hand for the fill.

Lake Hodges Dam

Lake Hodges dam was originally called the Carroll dam, the name it now has being in honor of Mr. W. E. Hodges, vice-president of the Santa Fe Railroad who are the principal owners of the water company. It is located in the narrow notch where the San Dieguito river passes through the porphyry hills, about 7 miles from the town of Escondido and about 40 miles from the city of San Diego.

The Lake Hodges dam is a multiple-arched dam designed to meet the conditions of configuration at the site, and was bid on in competition with two other types for the same location. It is a large dam, being 136 feet high and 750 feet long overall. The opening being wide at the bottom makes it large at its base and as the bedrock was mostly exposed, a small span of 24 feet center to center was used as being the economic span.

There are 25 buttresses and arches besides the part of the open spillway cut into the mountain side. The main portion of the dam has a vertical head of 10 feet and the front slopes are 1 to 1 or 45° , while the rear is steep in order to clear the overfalling water from the rollway part of the spillway, while at the same time maintaining stable equilibrium.

At the rear of the rollway portion a deck is placed over the whole space between the buttresses to prevent the water from the spillway running back underneath the dam. All of the open has counterfort buttresses at the rear and all parts are tied together with strut-tie beams, arch supported, and all heavily reinforced.

One of the lower tier of strut bears is widened to 4 feet and is used as a foot walk for inspection and to reach the outlet and sluice gates. The top strut is also designed as a foot walk and this at the end of

the spillway is connected by means of a stairway with a walk on a level with the tunnel under the spillway. As there would be no way to reach the gates from the north side, where the attendant must stay (as the south side is a precipitous mountain side), this tunnel terminates in a tower and a stairway leads up to the top of the tower and out to high ground beyond.

The open spillway is 360 feet long and 15 feet deep and is capable of passing a flood of 78,000 cubic feet of water per second. There are four 24 inch sluice gates placed in one of the lower arches and provision is made to draw off the service water at four different levels. On account of the level at which the water is to be used, there is a large dead

head area and about 2000 acre-foot capacity is below the draw-off point. The capacity of the reservoir up to the lip of the open spillway is 44,000 acre-feet and to the top of the crest at elevation 330, the capacity is 76,000 acre-feet.

The dam was erected by Bent Brothers, contractors of Los Angeles, under the direction of Mr. E. W. Case, chief engineer, C. E. Holyoke, resident engineer, on a unit basis, the cement being furnished by the company.

The San Dieguito Mutual Water Company of which Col. Ed. Fletcher of San Diego is president, Mr. W. E. Hodges vice-president, and Mr. E. O. Faulkner secretary-treasurer, are the owners.

ELECTRICAL GOODS IN JAPAN

(With the end of the war, business is looking to opportunities in foreign markets as well as at home. The present status of the electrical industry in Japan and the possibilities of American trade with that country along electrical lines is interestingly told in these brief extracts from a report of R. A. Lundquist, trade commissioner of the Bureau of Foreign and Domestic Commerce, who made investigations of the electrical business in the Far East for the government.—The Editor.)

In this country if a person wants a telephone installed in his home or office he is incensed if, on telephoning to the company in the afternoon of one day it is not done by the morning of the day following. In Japan, if we are to believe a newspaper of Tokyo, it appears that in the fall of 1917 there were 153,000 subscribers awaiting installation of apparatus, "some of them having waited for more than 10 years." It also appears that when a subscriber is willing to give up his wire he offers it to a broker who has a long list of buyers and the number is sold through one of these buyers for anywhere from 500 to 1,500 yen (\$250 to \$750). To show that these prices are not exaggerated an amusing instance is given, in a book now being used by the Bureau of Foreign and Domestic Commerce, where as high as \$750 had been asked for a number that could have been had for less.

This monograph of something over one hundred pages substantially bound, as well as illustrated, is entitled "Electrical Goods in China, Japan, and Vladivostok." It is written by R. A. Lundquist, Trade Commissioner of the Bureau of Foreign and Domestic Commerce, who visited those countries to make an investigation of the electrical business for the government.

Mr. Lundquist states that Japan has shown a wonderful electrical growth in the last 10 or 15 years. Central-station systems have been established in great numbers and service has been extended to all parts of the country. Official figures indicate there were 658 in July, 1917.

The development is greater than the figures indicate, inasmuch as many of the stations are hydroelectric and supply a considerable number of cities and villages. Japan, therefore, has been a large consumer of electrical goods. A few years ago these were imported, but the strong home market that was opened up brought about a development in the manufacture of all kinds of electrical apparatus, equipment, supplies and accessories, and now the

country is becoming a competitor in certain lines instead of a customer of the United States.

An idea of the growth of electrical manufacturing in Japan is shown by data from the trade returns of that country from which it appears that in the item of insulated electrical wire alone there was imported in 1912 an amount in excess of \$2,693,000. In electrical machinery the import in 1911 amounted to nearly \$3,000,000.

Up to September, 1917, there were 530 power and light systems in Japan, 42 electric tramways, and 48 railway and lighting systems. The figures also show there has been a strong development in public-service systems in that country in the last few years. In addition to the systems mentioned there were in 1915, 1,609 private plants and 121 government-owned plants, with 53 of the former and 6 of the latter under construction.

It appears that in 1915 there were 3,051,925 families using electric lights, and there were 39,310 power consumers with 42,789 motors, and 13,680 more classified as isolated or government-owned plants, while in 1916 there were 76 municipal or private electric railways in operation.

Heretofore American manufacturers have sold the largest percentage of generators, switchboards and switch gear. While switchboards and switch gear are turned out by Japanese works, they have not made the progress in these lines generally that they have in the apparatus lines. Americans should be able to sell higher-voltage equipment and considerable of the instrument and relay requirements for the boards that are made up locally.

Japanese engineers follow American transmission and distribution practice quite closely. Line construction, switching stations, and sub-station arrangements are generally similar to those employed in the United States, except in a few instances. It is estimated that there is about 20,000 miles of "extra high pressure" lines in operation.

The United States, Germany, and the United Kingdom have until the last few years furnished most of the requirements in motors and controlling devices, but since 1913 Japanese motors have been coming into the market more and more. While there are a few fair Japanese motors, the writer does not believe they will give continuous satisfaction as an average American motor will.

The import figures for ammeters and voltmeters show American goods leading strongly. Schools and central stations have bought high-class American testing instruments to a fair extent.

In wattmeters the United States has had a good trade for some years. American alternating-current meters in normal times cost more than foreign makes, but are better, though at present American meters are meeting foreign prices closely.

There is some small opportunity for the sale of higher-class American wiring supplies, such as flush push switches, receptacles, fancy shades, semi-indirect lighting units, etc., for use in new modern-type buildings.

There is not much opportunity for arc lamps. Street lighting is the greatest field for that kind of lamp, and in Japan there are not many wide streets, so that the demands in this line are limited. The incandescent lamp is more suitable for the average narrow-street lighting conditions, where low candle-power units are all that are required.

One class of goods that will probably find a market in Japan for a time are those that are used in connection with electric signs. The Japanese appear to be taking up electric signs to an increasing extent and appreciate the use of electricity for advertising purposes. It is believed that patented types of sign sockets, flashers, etc., will find an increasing sale. Fittings for outline lighting should have a small sale also, and some flood lighting was seen in operation.

This little book, which is adequately illustrated, closes with an account of conduct of trade with Japan, banking facilities, monetary system, weights and measures, customs tariffs, terms, business methods, packing, representation, trade-marks and patents, together with a description of the manufacture of electrical goods in Japan.

An account of opportunities for exporting electrical goods to Chosen and Vladivostok is also given.

FOREIGN TRADE VALUE OF AMERICAN MAGAZINES

BY GEORGE A. LOGAN

(The following extract from a report of the consul at Penang, Straits Settlements, tells the story of what the *Journal of Electricity* means in the Far East. There have been numerous inquiries from consulates and elsewhere in China, Russia, Australia and Japan and the magazine is today well represented in each of these countries.—The Editor.)

American magazines are famous for the excellence of their subject matter, the attractiveness of their typography, and the reliability of their advertising pages. They are not, ordinarily, found on

sale in Penang book stores, as there is little call for them, because the reading public generally has not made their acquaintance.

At the suggestion of this consulate a bookseller in Penang placed an order a few months ago for three well-known American publications, and has since increased the list and number of copies, besides taking some subscriptions. The magazines personally subscribed for by the consul and those sent to the consulate by the publishers are in constant demand.

Small Mail Orders Often Lead to Larger Business

This office knows of several mail orders which have been sent to advertisers in American publications, with satisfactory results. When the goods are received the purchasers talk about them and show them to their friends. Dealers soon find it profitable to stock the advertised articles, especially if the exporters assist them with advertising in the local press and otherwise.

Magazine advertising usually brings from foreign countries individual mail orders at first. They are often from persons connected with business houses and are frequently in the nature of trial orders, although that fact may not appear.

A Penang druggist recently ordered for personal trial a device for stropping razor blades which he had seen advertised. Finding it satisfactory, he purchased a lot for his store through a commission house which handles most of his American trade. Within two weeks after delivery all were sold and a larger order was placed. The druggist's experience was that by using this device he obtains two or three months' service from a blade that ordinarily would be good for only a few shaves. He knew that such an article would be a boon to men on plantations and tin workers who are far from town.

American Magazines for Foreign Reading Rooms

It would pay the manufacturer of a magazine-advertised article to inquire of those magazines which carry his advertisements whether their publications go to public libraries, consulates, commercial associations, clubs, and similar institutions which maintain reading rooms in the territory served by the foreign buyers of his line; and if not, to arrange that they be sent to such organizations. Each advertiser who did this would be doing valuable missionary work for American trade in general as well as for his own business. This might be done co-operatively through trade associations whose members are interested in foreign trade. The magazines which entered into such an arrangement would thereby extend their influence, increase their subscriptions, and make more effective their service to advertisers and readers.

Such publications of high standing are very useful in placing properly before the intelligent readers of other countries American thought, ideals, institutions, and policies. In these days of increased interest in American affairs that is of important ethical and commercial value.

INFLUENCE OF FORESTS ON WATER POWER SUPPLY

BY ALFRED A. GRIFFIN

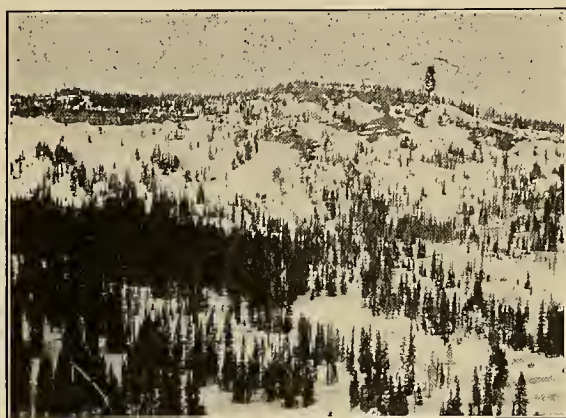
(The melting of the snow determines in large measure the flow of the Western rivers—and in consequence in large measure the water power available at various seasons. The influence of forest covering in prolonging the period of melting is here interestingly suggested in extracts from a report presented to the U. S. Weather Bureau. The author is forest examiner of the Portland, Oregon, district.—The Editor.)

In order to find with some definiteness the effect, if any, of forests in representative portions of the Cascade Range on the melting of the winter snow cover, the Forest Service carried out studies of snow melting on three separate watersheds: The Tumalo area in central Oregon, the Wind River area in southern Washington near the Wind River Experiment Station, and the Yakima area on the head-

Forest Examiner W. J. Sproat of the Deschutes National Forest, those at the Wind River Experiment Station area by the writer in 1916, and by Forest Assistant C. J. Kraebel and Ranger A. E. Kloe in 1917; and those on the Yakima area, carried on in 1917 only, were conducted by Deputy Supervisor W. F. Ramsdell and Ranger W. G. Hellen, both of the Wenatchee National Forest. In each study the depth, density, and distribution of the snow cover were observed throughout the melting season at 8 to 20 typical observation points or stations.

Data Collected

Full reports for each of the studies are available in the Forest Service files. For the sake of brevity



Looking across the fork of Tumalo Creek. Some dense timber appears on the left, but most of the forest cover is very light.

waters of that river in central Washington. These locations permit the studies to show the value of forests to the irrigation and power interests, as well as to furnish a basis for comparing the effect of forests of this region with those of other regions.

The studies on the Tumalo area were carried through both the 1916 and 1917 seasons entirely by



Small mounds of snow beneath the forest litter show how this has protected the bank from melting

and clearness the results are given here, summarized by areas studied.

Tumalo.—The four pairs of stations observed on this area in the spring of 1916 were typical of small burns or open areas of from 1 to 4 acres in extent, and the immediate borders of the adjacent stands of mature timber. The greatest average depth of snow measured in the timber was 121.2 inches on April 5, 10 inches less than was measured in the open on the same date. On June 22 the first open station became bare of snow; on July 18 no snow was left on any of the stations in the open. As the snow disappeared from the individual stations in the open there remained at the corresponding forested stations an average of 19.3 inches of snow. At an average density of 45 per cent, this is equal to 8.7 surface inches of water; 2.1 inches, about 25 per cent, still remained two weeks later at the time of the last observation.

In the spring of 1917, with slightly less snow and a briefer melting season, the equivalent of 5.2 inches of water was retained by the forest-covered stations after the "open" stations became bare; at the end of the second week all were bare. In 1917 observations included eight pairs of stations, the new open stations being in larger openings.

Wind River.—The results for 1916 in the densely forested Wind River region are as follows: From a maximum average depth of 70.8 inches of snow¹ an average of 28.2 inches remained at the forested stations as the corresponding stations in the open became bare. Part of this remained for six weeks longer. The retarding effect of the forest cover was twice as strong on the deeply snow-covered mountain slopes as on the flat. About 66 per cent of the maximum

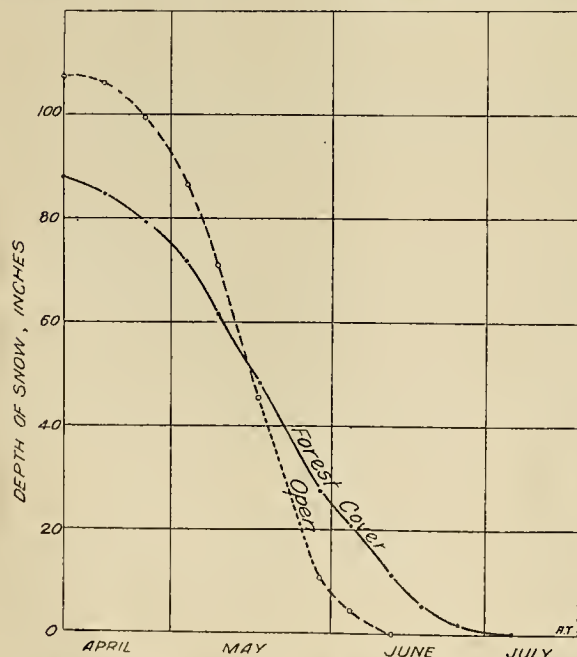


Fig. 1—Depth of snow at station in the forest and in the open, Yakima watershed, 1917

¹Average of flat and mountain slopes.

water equivalent was conserved on the one and 38 per cent on the other.

In 1917 administrative exigencies permitted complete examinations of only three pairs of stations on the flat. The maximum average depth of snow in the forest was 25 inches. The stations in the open became bare in April, leaving an average of 6.2 inches at the stations in the forest. This was equal to 3 inches of water, or 40 per cent of the maximum water equivalent.

Yakima Area.—The observations on the Yakima watershed cover the melting season of 1917 only. From a maximum of 88 inches of snow at the forested stations in early April, there was still an average of 19 inches left at each forested station when the corresponding station in the open bare—about June 1. This snow, equal to 6.9 inches of water, gradually melted during the next four weeks.

¹Water equivalents are shown in Table 1.

Correlation of Results

Table 1 summarizes the water value of the snow cover retained by the forested areas. The 7.5 inches of water equivalent, found to be the mean for all



One of the Wind River stations in the open—snow gone for over a week—April 12, 1916. This shows the brush land which the study considers as open land.

stations, lasted on the average for 17 days and at some forested stations for more than 42 days. The value of the forests appears to be greatest on Wind River, and in 1916, probably because of the high mountain slope stations with deep snow mantle under heavy forest cover, and least on the Tumalo area, under the “dry slope” conditions.

The curves of figure 1 show graphically for the Yakima study the more rapid melting at the open stations and the proportion of snow retained at the

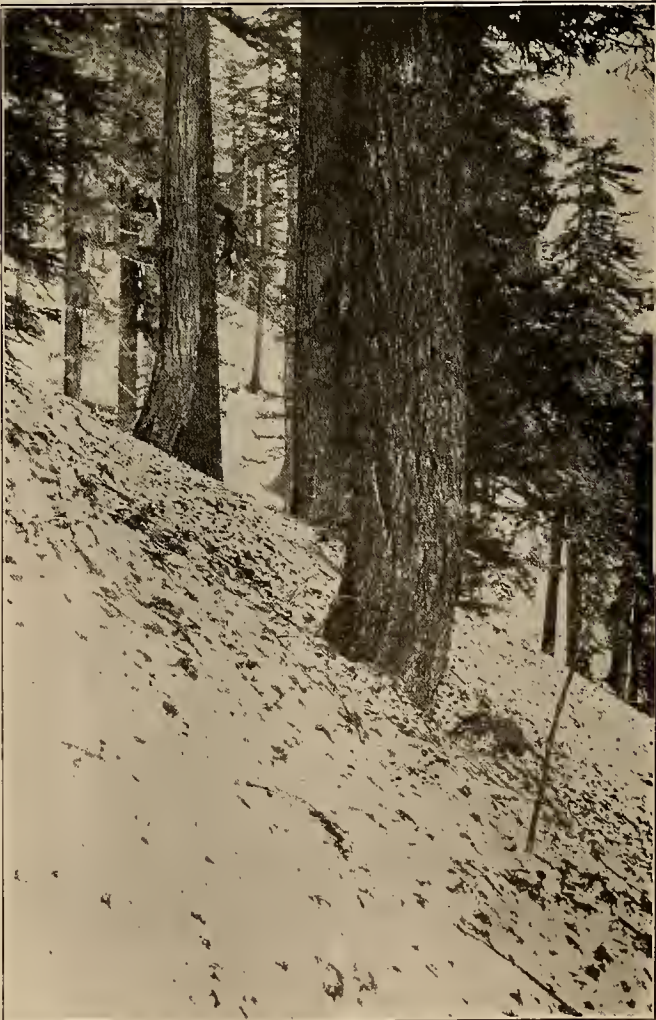
TABLE 1.—The water equivalent of the mean depths of snow retained by the forested stations when the corresponding open stations became bare, and for three weeks thereafter, expressed in inches and in per cent of the maximum snow cover.

Study.	Max. water equiv- alent	Weeks after stations became bare.							
		0	1	2	3	4	5	6	7
Tumalo, 1916	47.0	8.7	18	6.0	12	2.1	4	....	....
Tumalo, 1917	44.0	5.2	12	0.1	....	....	....	....	....
Wind River, 1916 ¹	25.8	13.5	52	9.5	37	8.0	31	5.3	21
Wind River, 1917	7.6	3.0	40	0.6	8	....	....	....	....
Yakima, 1917	24.6	6.9	28	3.2	12	1.6	7	0.3	1
Mean	29.8	7.5	30	3.9	14	2.3	9	1.1	4

forested stations. As shown in Table 1, similar curves drawn for each of the other areas would tell very much the same story. The curves given also bring out the frequently observed fact that during the early spring there is a greater depth of snow at the stations in the open than at those under timber. This condition existed on the other areas excepting at high altitudes at Wind River where dry snow with less sunshine seems to have permitted a larger proportion of the total snowfall to reach the ground under the trees.

Comments.

The most important weaknesses of this study lie in the short period covered by the observations—two seasons at the most, and in small practically unavoidable differences in the site factors of the stations of each pair. Because of the severe conditions and amount of labor necessarily involved, it quickly appears that a long series of complete and accurate



The corresponding Wind River Station in the forest on April 12, 1916. Under the forest cover there is still over 50 inches of snow, equal to nearly 2 feet of water.

observations will be quite expensive. Such measurements might possibly be made in connection with annual snow surveys for irrigation purposes. The irregularities in factors of the stations are balanced through the selection of a considerable number of stations (54) in the different regions and by three different men.

Drifting by the wind was of comparatively small importance throughout the study. Very large and deep snow drifts occur on comparatively small areas near the summit of the Cascade Range, but are not found on the middle slopes or on these areas. The lesser blowing and drifting of snow, chiefly in the open areas, appears to be practically self-compensating.

The results of this study are in general accordance with Swiss figures quoted by Fernow¹—that the retardation of snow melting in forests is 5 to 8 days in general and may be several weeks—and also with the observations of Church. In agreement with the latter is the tendency of the snow in the forest to be deepest and last longest in the small openings of the denser forests. This tendency was especially noted on the Wind River area and may partly account for the late melting of the snow in the small open areas characteristic of the Tumalo area. In large openings the protecting influence from the forest would be dissipated and melting consequently more rapid.

An unusual factor in delaying the melting within the Douglas fir type of forest is the protection given by the irregular layer of even very slight bits of moss, twigs, bark, and other litter weathered from the trees. Fragments like those shown in the picture, which in the open would materially hasten melting by absorbing solar heat, in the forest serve as a crude but effective insulation from the warmer air currents above the snow. In a more open forest this effect is less prominent.

An opposing influence appears in the ability of the bushes, tree trunks, and other large objects to hasten melting by radiating or reflecting into the snow the heat which they receive from various sources. Hollows or bare spots around trees, etc., are frequently noted in the spring. They seem to be important in all coniferous forests but especially in those of the yellow pine type.

Application of Results

Expressed in irrigation terms, the figures given in Table 1 mean that on the areas studied the average square mile of forest cover retained the equivalent of between 720 and 160, averaging 400, acre-feet of water in the form of snow after the open areas had become bare. Neglecting losses through seepage and evaporation, the average of 400 acre-feet is sufficient supply for about 150 acres of cultivated land for the entire season, or for about 650 acres for one month during the peak of the irrigation season (during the summer low-water period). Of course some loss is to be expected in the natural flow of the water down to the lower valley; but it will, at a time when the ground is already saturated, be much less than the normal loss. It is also probable that some of the water will flow down stream too

early to be of greatest use in irrigation. Making considerable allowance for these losses, it appears that the forest cover is a very important and very valuable factor in increasing water available for irrigation.

In terms of time, the effect of the forests was to spread the 400 acre-feet of retained snow through a period averaging 17 days in length. The retardation of this amount of snow is sufficient to be of great importance to irrigation interests, especially as it is generally understood that a forest cover tends to "flatten out" the crest of a flood, and thus to increase the minimum flow at periods of low water. A forest cover thus supplements the possible artificial reservoirs. This study furnishes measurements, however, not of stream flow but only of the material out of which stream flow is made.

¹Fernow, B. E., *Forest Influences*, Bull. 7, Div. of Forestry, p. 137.

THE ELECTRIFICATION OF SEED

Some five plants for the treatment of electrified seed-corn were installed in England by the beginning of 1918, according to a recent article in the *London Electrical Review*. The seed is treated by being placed in a tank containing liquid chemicals. The tank is connected up to the electric supply, and immediately the seed is placed in the tank the electricity is turned on, and passes through the grain, the process continuing from three and one-half to six hours, according to whether the seed corn is barley, wheat, or oats. At the expiration of the period required to treat the seed, the current is switched off, and the grain is conveyed from the tanks to a kiln—up to the present a malt-kiln has been found the best—and is dried at an even temperature. The seed is then packed up and sent out to the farmer.

Nearly 2,000 acres of electrified seed-corn were harvested in 1918. One farmer grew as much as 300 acres, while others ranged downwards to as low as one acre.

So much has been said in the past concerning the application of electricity to farm crops, that it was only to be expected that a considerable amount of interest would be taken in the results of the 1918 harvest of grain grown from electrified seed, and much criticism brought to bear on the process.

An investigator—not appointed by the patentees nor by any person interested in the process—took measurements of the standing corn, which was cut in his presence, and he afterwards conducted the threshings himself. The results of his investigations were as follows:—

W. W. Lovelace, Piddlehinton, Dorchester, gain on wheat from the produce of electrified corn over untreated, 12 bushels per acre.

C. Foot, Bincombe, Dorchester, gain on wheat, 6½ bushels per acre.

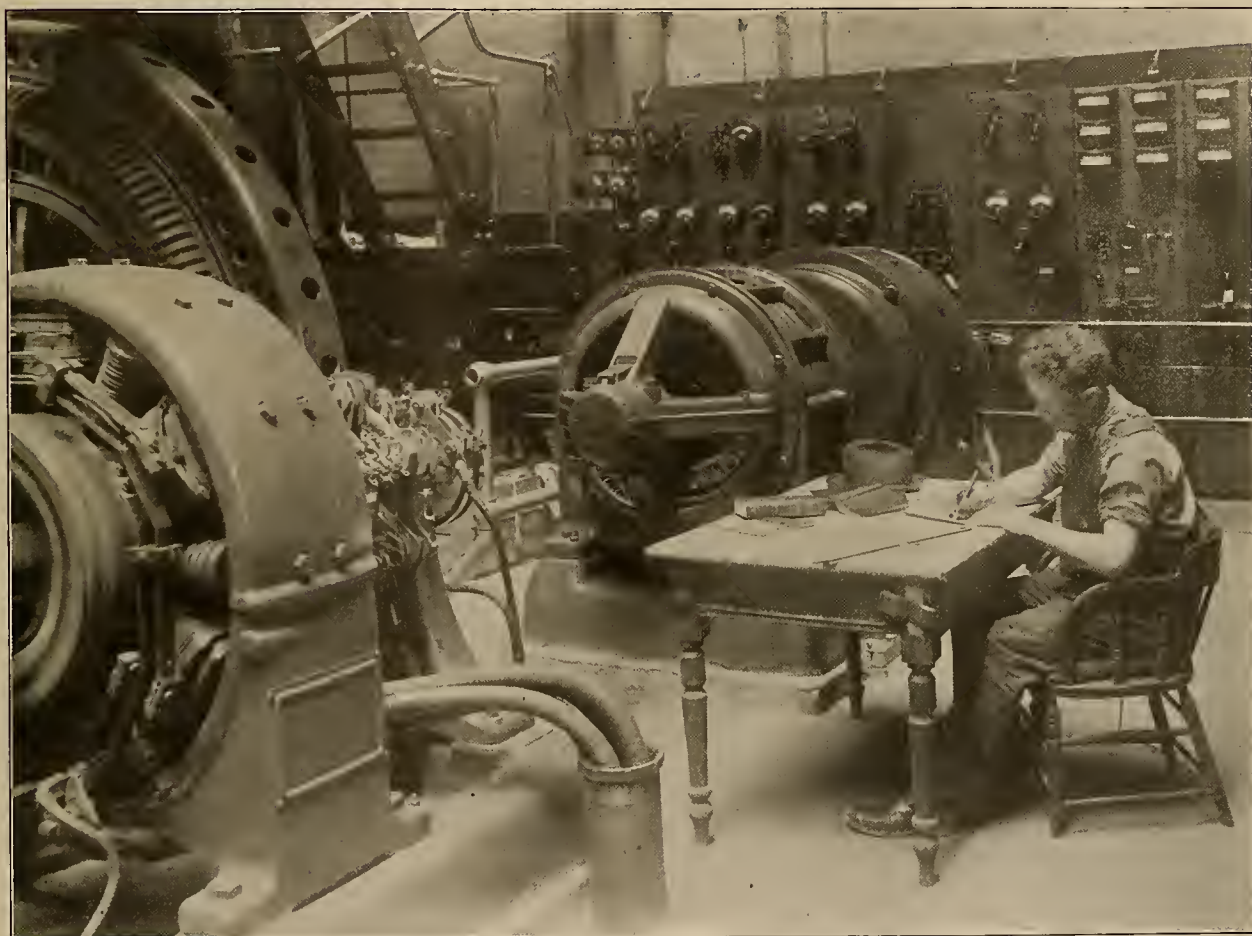
H. J. Cake, Burton, Dorchester, gain on barley, 16 bushels per acre.

W. W. Lovelace, Piddlehinton, Dorchester, gain on oats, 5 2/3 bushels per acre.

A PRACTICAL COURSE IN ELEMENTARY ELECTRICITY

BY H. H. BLISS

"Know the fundamentals" is the cry of the hour. Here is the beginning of a series of discussions in the columns of the Journal of Electricity in cooperation with the Extension Division of the University of California on the all-important subject of elementary laws of electricity. The forwarding of this undertaking is a matter that strongly appeals to every member of the electrical industry—manufacturers, jobbers, central station men, electrical contractor-dealers—and it is receiving hearty endorsement from all quarters. The California Electrical Cooperative Campaign, now nationally recognized as one of the most helpful institutions of its kind in existence, has endorsed the series. Amplified discussions and helpful problems in addition to the matter herein published will be forwarded and your efforts later corrected by the Extension Division. You may enroll for this correspondence course by paying a fee of five dollars to the Extension Division. The text for the course is the Journal of Electricity, an annual subscription for which is two dollars and a half. The author of this series is in charge of technical instruction for the Extension Division at the University.—The Editor.)



Spare moments in the power station are put to good use in the study of electricity. This practical course in which the Journal of Electricity cooperates with the university will be taken advantage of by power operators, telephone men, electrical salesmen and office workers—in short, it will be of great assistance to workers in all lines of endeavor connected with matters electrical.

Beginning with the next issue of the Journal of Electricity there will be published in each number an article on some phase of electrical study. The series of fifteen papers is prepared in the Extension Division of the University of California and forms part of an extension correspondence course, as explained in detail below.

Following is a list of the subjects of the articles:

- (1) Ohm's Law and the Electric Circuit.
- (2) Series and Multiple Circuits.
- (3) Power — Losses — Efficiency.
- (4) Electromagnets — Transformation of Energy.
- (5) Wire Calculations.
- (6) The Generator.
- (7) Armature and Field Windings.
- (8) Losses and Reactions in Generators.
- (9) Electrolysis — Batteries.

- (10) Direct Current Motors.
- (11) Motor Characteristics.
- (12) Electric Meters.
- (13) Lamps and Illumination.
- (14) Interpole Machines.
- (15) Suggestions for Increasing Personal Efficiency in the Electrical Industry.

The instructive material of the series and of the accompanying correspondence course is arranged to meet the needs of those who have to do with electrical apparatus, circuits or power. It is therefore of importance to station operators, office employes, salesmen, contractors, dealers, jobbers, telephone and telegraph men, manufacturers' employes, repairmen—in fact, to all who are connected with the electrical industry.

Each article will deal with one subject in a general way, and thus the series will constitute a text explaining fundamental principles. In order to be of help to those who have not made a study of electrical theory, the language and descriptions will be made as simple as possible, taking for granted no special knowledge on the part of the reader.

As stated above, these papers constitute an integral part of a new University Extension correspondence course in Electricity. Journal readers who enroll with the Extension Division of the University of California will receive, for each of the fifteen lessons of the course, several pages of mimeographed instruction supplementing each article. These lessons go into detail concerning circuit and machine characteristics, efficiencies, applications of principles and electrical calculations. Each lesson contains examples of the simpler computations, and a list of ten or more practical problems which students may solve for home study and submit to the University for criticism and correction. After the problem sets are read, they will be returned to the senders, together with answer sheets showing the instructor's method of performing each computation.

For the services rendered in connection with the correspondence course the University is obliged to make a charge of \$5.00. This is the entire cost of the course to readers of the Journal of Electricity. Those interested may enroll by writing to the University of California Extension, Berkeley, or to the office of the Journal of Electricity.

WHAT IS A FAIR RETURN?

(A ten per cent profit on gross earnings may mean a two per cent return on the investment—or vice versa, depending on the nature of the business. A brief explanation of why the public utility must ask for a higher rate is here reproduced which very concisely clears up a point on which most people are inclined to be hazy. This is a sample of the type of advertising which is helping to educate the public. —The Editor.)

The following analysis of the rate problem from the standpoint of a fair return appeared in the *Electrogram*, a little paper for the public published by the Puget Sound Traction Light & Power Company:—

Men go into business to make money. The business that offers the best profits at the least risk to the capital invested and requiring the least capital to launch is the most attractive to investors. But while profits and amount of capital required are factors that receive large consideration, risk is a factor that probably outweighs all others. The new and untried business offers the largest risk. A proved business the least. So into all business enters as the final and determining factor the rate of return.

It has become a fixed policy to say that a public utility like a street car system shall be permitted to earn only a "fair return." Then the question arises: What is a fair return? That is not always easy to determine, but public service commissions and courts have taken a short cut and said that it must be a fair rate for the actual money invested. The public, without knowing much about it, usually accepts that

rule. As between private business and public utility business there is a wide difference when the rate of return rule is applied.

Many private businesses requiring an investment of not to exceed \$1,000 can do an annual gross of \$10,000. If that yielded a net of only \$1,000 it would mean 10 per cent on the gross, but it would be 100 per cent on the investment. That would not be considered excessive by anyone. In the public utility field, however, an annual gross business of ten times the total investment is not possible. It is usually the other way around, and the capital investment required must be from five to eight times the possible gross business done, which is to say that a public utility must invest \$100,000 approximately for every \$15,000 to \$20,000 of annual gross.

But—a net of 10 per cent of gross, in that case, would mean a net return of only two per cent or less on the actual dollars invested in the business, while a net return of 5 per cent on the investment would require from 20 to 40 per cent of the gross annual revenues.

It would be obviously impossible to secure capital to build street railway systems, interurbans and power and lighting plants for a two per cent return, and in times like these equally impossible on a five per cent return.

By common consent any business man or private industrial or merchandising corporation seems to be permitted to earn any rate of return on the actually invested capital possible so long as it is done by honorable dealing. Only public utilities, rendering a public service, are restricted in this respect by limiting them to what approximates a going rate on the best and safest securities.

Any other private business is permitted to make earnings that bear some definite relation to the magnitude of the investment required and the increased ratio of risk as the investment increases.

Usually a public utility is a monopoly, and when it is the risk is not so great. That seems to have had much to do with fixing the general rule of a "fair return" as interpreted by commissions and courts. If the public had a better understanding of the amount of money required to establish and conduct a public utility, the magnitude of the investment in comparison with the relatively small gross income and the actual relation of what appears to be a large net profit to the investment, then the public could appreciate the fact that the rate of return which a utility can earn is very small—much less, in fact, than the average critic of a public utility would be willing to accept as an interest rate on his own money, even if secured by gilt-edged first mortgage on income real estate.

A public utility in a growing city is a growing business, requiring constant supplies of new money in order that it may develop and meet its obligations and responsibilities to the community.

A FAIR RETURN is that rate of return which will induce investors to voluntarily put their money into the utility—a return that will provide money as it is needed for the growth and development of the utility.

SPARKS—Current Facts, Figures and Fancy

(A movie film of glass, a plan for saving fuel by burning refuse, another origin of the peace league idea, and a story of an electrical escape from a German prison camp are among the items of interest. Few people know that the method of obtaining potash from cement dust originated in a plan to clear away the fog—nor that Mr. Dun was the first bill collector.—The Editor.)

When you “dun” a person for an unpaid bill, do you realize that the word was really the name of a man, an Englishman called John Dun, who had such success in collecting bills that his name passed into current phrase and became a synonym for collecting a bad debt?

* * *

A motor-driven machine for cleaning drawings is one of the latest conveniences for the drafting room. The machine is driven by a variable speed motor which can be attached to any electric light socket and will operate on either direct or alternating current.

* * *

A knowledge of electricity came in handy with one American prisoner in the German prison camp at Karlsruhe. Lieut. E. V. M. Isaacs of the U. S. Navy escaped one dark night by short-circuiting all the lighting circuits of the camp, and escaping through the barbed wire under cover of darkness.

* * *

Another origin of the peace league is that the idea upon which President Wilson is now working was first given to the world by that good old Quaker, Governor William Penn of Pennsylvania, in the year 1694. He suggested that the peace of the universe could easily be maintained by a congress of nations and the scheme which he then outlined is substantially the same as that suggested by the President. Penn first printed his views on peace in The Old South Leaflet in 1694 and the article appears in No. 25 of that periodical.

* * *

It is reported that a new method for producing motion pictures by projection through a glass film (as distinguished from the usual commercial film of celluloid) has been worked out at Jena, Germany. This new glass film has the advantage of being only one one-hundredth as large as the film now in use. This so-called glass “film” is in reality a very thin plate of glass, upon which the necessary number of prints are made, and which is shifted mechanically before the arc. It is not known whether this method of projection is in commercial use.

* * *

During the visit of the Inter-Allied Petroleum Council of this country in the latter part of November, it was revealed for the first time that a pipe line had been laid across the neck of Scotland, through which oil fuel could be pumped in a cold state at the rate of about 100 tons per hour. At one end 16 huge tanks have been constructed with a

holding capacity of a thousand tons, and at the other end the oil falls into reservoirs easily accessible to the fleet from its base at Rosyth. The pipe is 8 in. in diameter and there are two intermediate pumping stations.

* * *

For the purpose of encouraging the agriculturists of Sweden to participate in the movement for the further development of hydroelectric power, an association was formed last spring, consisting of representatives of electric power companies and rural societies. The aim of the association is to furnish advice and information relative to the distribution of energy, and to render financial assistance in the purchase of electrical apparatus. A typical example of developments of the nature contemplated is the purchase of a waterfall by a group of farmers in order to obtain electric power for their farms.

* * *

It is claimed that the whole of the refuse collected from houses (such as ashes, cinders, paper, straw, and vegetable matter) can be dealt with and turned into fuel, thus conserving the coal supply. The inventor assumes that in a community having a population of 100,000 there would be 25,000 tons annually of refuse, and he shows that the sale of the prepared fuel, even when marketed at a low price, would result in considerable revenue and profit. He adds that, besides being a means of providing a valuable fuel out of material now wasted, the briquets can be used for domestic and steam-raising purposes and thus save the whole of the present cost of disposal.

* * *

The obtaining of potash from cement dust was more or less of an accident. A number of years ago an instructor in the department of chemistry of the University of California devised a process for dissipating fogs and mists by means of a high tension electrical discharge. This process, first used for cleansing the air of acid particles that were a nuisance and a monetary loss in various acid factories and metallurgical works, and then for purifying air of dust and other small particles, has become a most important industrial process and is used all over the world. It was installed at a cement factory at Riverside to eliminate dust. When the dust was examined it was found to contain potash; a method was developed to collect it, and the method is now used all over the United States in potash production. Already it has changed the character of some of the cement mills—potash is now the main source of profit, and cement is merely a by-product.

PERSONALS

Fred A. Williams, born on a farm in Harrison County, Iowa, June 13, 1877, has recently entered service as a member of the Public Service Commission of Oregon. After going through the country schools and finishing a preparatory course at the Woodbine Normal, Mr. Williams entered the University of Iowa at Iowa City in 1895, graduating with the degrees of Ph.B. 1899 and LL.B. 1900. Immediately after graduation he entered the practice of law at Council Bluffs, Iowa, came to Oregon in 1906, and has been practicing at Grants

Pass, Oregon, since 1908, in partnership with George W. Colvig, who was a member of the first Railroad Commission of the State of Oregon. Mr. Williams was nominated on both the Republican and Democratic tickets May 17, 1918, at the primaries for the office of Public Service Commissioner for the state at large, and was elected to the office at the general election the following November.

C. S. Northcutt, of the Sierra and San Francisco Power Company, Modesto, was a recent San Francisco visitor.

G. J. Kuhut, manager of the Los Angeles street railway system, with his wife spent some days in San Francisco recently.

James F. Lincoln, general manager of the Lincoln Electric Company with headquarters at Cleveland, Ohio, is a recent San Francisco visitor.

H. Asami, a graduate engineer of Kioto University, Japan, is a recent San Francisco visitor who is interested in hydroelectric power plants operating under high heads.

Warner Marshall of Boston, president of the Washington Coast Utilities with offices in the New York building, Seattle, recently visited the Seattle office on business of the company.

Burton Gibson, representative of the Edison Electric Appliance Company, Inc., has left for the Hawaiian Islands to represent the three divisions of his company, with headquarters both at Honolulu and Hilo.

H. L. Aller, general manager of the Pacific Gas & Electric Company of Phoenix, Arizona, is a recent San Francisco visitor. W. C. Hornberger, general superintendent of the company, accompanied Mr. Aller in his visit.

J. V. Painter, sales manager of the Appleton Electric Company of Chicago, is a recent Pacific Coast visitor. He has recently spent some days in San Francisco in consultation with his Pacific Coast representatives, Keeler, White Company.

C. E. Magnusson, head of the department of electrical engineering at the University of Washington, Seattle, is a recent California visitor, where he attended at Berkeley the sessions of the Pacific Coast Conference of the National Research Council.

H. E. Bixby of the Burley Electric Company, prominent engineers and contractors of the Idaho district with headquarters at Burley, has been spending a few days in San Francisco on business relating to contracts they have in hand in connection with electrical machinery for irrigation work.

W. R. Hendry of W. R. Hendry Company, 314 Hoge building, Seattle, district agents for Delta Star Electric

Company, Whiting Foundry Equipment Company and other interests, is making a five weeks' business trip through the East, including in his itinerary Chicago, Pittsburgh, New York, Boston and Des Moines, Iowa.

Walter E. Conklin, whose past experience has been along lines of business efficiency, cost accounting and office management, has been engaged by the Jaggard-Sroufe Company of Portland, Ore., as business manager. Mr. Conklin is putting into effect a carefully developed system of accounting adapted to the electrical business.

Mason B. Starring, head of the eastern company that controls the United Railroads of San Francisco, was a recent visitor in that city where he took up the matter of the financial reorganization of the corporation with the other members of the reorganization committee—Frank B. Anderson, William H. Crocker, Herbert Fleishhacker, I. W. Hellman, Jr. and John D. McKee.

J. G. De Remer, formerly vice-president and chief engineer of the United Light & Power Company of San Francisco, subsequently consulting engineer for the American District Steam Company and recently with the U. S. Shipping Board as a member of the ship protection committee, has returned to San Francisco where he intends establishing a research laboratory to investigate various electrical and mechanical problems which he formerly had under way in New York City.

Dr. Ohsuke Asano has been granted the title of Professor Emeritus by the Tokyo Imperial University. He is the first electrical engineer to receive this title in Japan. Prof. Asano's career has been unique in promoting the growth of electrical science and industry in Japan. His forty years' service to his country in various capacities has been well known and the present honor is a most appropriate and deserved one for him. Prof. Asano is now a member of the Board of Directors of Waseda University and the Dean of the College of Engineering of the same institution.

H. L. Garbutt, manager of the line materials section of the Supply Department of the Westinghouse Electric & Manufacturing Company, is a recent Pacific Coast visitor. While in San Francisco Mr. Garbutt delivered a most interesting and instructive talk to representatives of his company and to a number of engineers prominent in high tension power development in this section of the West. The talk was at the San Francisco Engineers' Club rooms and covered the salient features of important research investigations in the insulator problems that have recently been undertaken by his company.

H. H. Jones, general manager of the San Diego Consolidated Gas & Electric Company, as chairman of the general convention committee for the Coronado Convention of the Pacific Coast Section, N. E. L. A., has been in San Francisco recently to perfect arrangements in the northern district of California for attendance at the convention of an unusually large number of delegates. San Diego lingers in the memories of Pacific Coast men as a place of hospitality and a place well worth visiting when Mr. Jones and his company are to

be the hosts. Many still recall the enjoyable and profitable convention of the Pacific Coast Gas Association which met under Mr. Jones' guidance at San Diego in the fall of 1912. The character of the papers and the enthusiasm already displayed over the forthcoming convention at Coronado April 30-May 2 augur well for a thoroughly representative gathering at this place from all sections of the West and even from many quarters of the East.



Curt C. Davis, field representative of the California Electrical Cooperative Campaign for the San Francisco Bay district, although only recently appointed upon this work, is already arousing interest in his district and compiling much helpful data that will be of great assistance in forwarding the work of the campaign during coming months. As a graduate of the University of California, a former representative of the General Electric Company and later of the Pacific Hardware & Steel Company, Mr. Davis comes to his new



position well acquainted with its problems and well prepared to be of invaluable assistance in their successful solution.

Guy W. Talbot, president of the Pacific Power & Light and the Portland Gas & Coke companies, is recuperating from serious operations at the St. Vincent's hospital of Portland.

Samuel Hubbard was recently elected to fill the vacancy in the directorate of the Pacific Telephone & Telegraph Company caused by the death of F. W. Eaton, former treasurer. George A. Newhall succeeds F. G. Drum, who retires.

G. J. Guivers, formerly secretary of the Utah Association of Electrical Contractors and Dealers, is now located with the Pocatello Electrical Supply Company, who have taken over the management of the Butte Electrical Supply Company.

Melvin C. Osborn, for twelve years commercial agent for the Washington Water Power Company, has resigned. Mr. Osborn came to Spokane from Butte, Montana, where he was associated with the Butte Electric Company. Prior to that time he was associated with commercial enterprises in California.

G. W. Shaner, formerly with the Westinghouse Electric & Manufacturing Company with headquarters in San Francisco, is now with the Utah-Idaho Central Railroad at Ogden, Utah. This company is building a new substation equipment at Ogden that has a motor-generator set of special windings, an interesting description of which will appear later in the Journal of Electricity.

Ralph Elsmann, formerly connected with the Pacific Gas & Electric Company, has recently been elected vice-president of the Kings County Lighting Company, Brooklyn, N. Y. Mr. Elsmann has been general manager of the company, which office he still retains, and his elevation to the vice-presidency comes as a recognition of his service for the company and

incidentally for the industry as a whole. Mr. Elsmann spent nine years on the Pacific Coast and during that time made many friends throughout the West.

Lieut. Col. A. H. Griswold, plant engineer for the Pacific Telephone & Telegraph Company, who was in charge of all American communication work back of the trenches both in England and France, was the guest of the San Francisco section of the A. I. E. E. at a luncheon on Friday, Feb. 28th. Colonel Griswold is preparing a formal paper on this subject which is to be given before the A. I. E. E. in April.

Clarence R. Young, sales manager of the Pacific Power & Light Company, Portland, Oregon, has accepted a position in the Securities Department of the Electric Bond & Share Company at New York. Mr. Young has been with the Pacific Power & Light Company for the past eight years and has held the following positions: Chief clerk to the purchasing agent, chief clerk to the vice-president and general manager, and sales manager. He graduated from Stanford University as a civil engineer in 1910.

OBITUARY

E. H. Jacobs, construction engineer and superintendent of all distribution lines of the Western States Gas and Electric Company in Stockton, died recently as a result of influenza, which was followed by pneumonia.

JOINT CONVENTIONS AT CORONADO

Plans for a most successful convention of all electrical interests at Hotel del Coronado April 30-May 2 are rapidly being shaped under the direction of H. H. Jones of San Diego, chairman of the convention committee.

Announcement is made that the National Electric Light Association will be officially represented by Mr. R. J. McClelland, chairman of the National Hydroelectric and Technical Section, and chief engineer of the American Power and Light Company. Col. H. M. Byllesby is planning to be present and is scheduled for the principal address at the banquet. Paul M. Lincoln, past president of the American Institute of Electrical Engineers, will also be in attendance.

The California Association of Electrical Contractors and Dealers have appointed the following members to cooperate with the convention: C. L. Chamblin, Chairman, T. J. Bennett, R. V. Oyler, G. E. Arbogast and F. J. Somers.

The Pacific Division Electrical Supply Jobbers' Association will hold their meetings May 28-29, so as to leave the rest of the week for attendance on N. E. L. A. meetings.

Some spectacular aviation exhibits are planned as a special attraction to those attending the meeting. These, in conjunction with the sports and trips for which San Diego is famous, will add much to the enjoyment of the convention.



THE SCENE OF THE CORONADO CONVENTION

A view of San Diego harbor from Point Loma—Coronado is in the distance. Not only is the program to be one you cannot afford to miss, but weather conditions and surroundings are promised as ideal and a host of entertainment features will keep you busy in every spare moment you happen to have. Don't forget The Occasion—Joint Conventions of California Association of Electrical Contractors and Dealers, Pacific Division Electrical Supply Jobbers' Association, Pacific Coast Section N. E. L. A. The Place—Coronado Hotel. The Time—April 30 to May 2.

MEETING NOTICES FOR ELECTRICAL MEN

(An interesting discussion of the proposed bill for licensing electricians in California formed a recent program at the San Francisco Development League. Progress in the state association of contractors and dealers and plans for the victory convention at Vancouver and the big Pacific Coast event at Coronado further marked events of the past two weeks' period.—The Editor.)

Vancouver Convention

The spring convention of the Vancouver Association of Electrical Contractors and Dealers is planned for May 26th and 27th. The event is announced as the greatest convention ever held in western Canada. Samuel A. Chase is to attend and W. L. Goodwin is counted upon to be present. The work of organization is rapidly taking shape and the names of all central stations, manufacturers and contractor-dealers west of Winnipeg have been secured with a view to holding a wide-open convention. May 27th being Empire Day in Canada, there will be excursion rates from all parts which will be acceptable over the convention dates.

Northern California Contractors and Dealers

A meeting of the Northern California Association of Electrical Contractors and Dealers was held in Oroville during February. Those in attendance were W. H. Gribble and W. S. Cass, both of Chico; H. Berg and C. Iverson, both of Marysville; E. Russell of Colusa and G. A. Dahlmeier of Oroville. Matters of the trade were discussed.

San Francisco Section A. I. E. E.

Arrangements have been made with the Engineers' Club of San Francisco by which a luncheon table is reserved on Wednesdays for any members of the A. I. E. E. who wish to be present.

Oregon Society of Engineers

The subject of Coal was taken up at the March 3rd meeting of the Oregon Society of Engineers, held in Library Hall, Portland, Ore., at 8 o'clock. "Coal is King," a four-reel motion picture, was presented by the National Association of Stationary Engineers, which illustrated the economical use of fuel in power plants. A further attraction was offered members on March 1st, when a personally conducted tour around the new Municipal Grain Elevator was opened to them.

Conference of California Irrigation Districts

The State's plan to construct storage reservoirs for the purpose of impounding water for irrigation and for the development of electric power was endorsed at a meeting of the Irrigation Districts of California, in session at the Sacramento Hotel. The organization further recommended the passage of a bill allowing irrigation districts to establish and conduct power plants and to distribute electricity where it can be done in connection with irrigation projects.

Oregon Association of Electrical Contractors and Dealers

The regular meeting of the Oregon Association of Electrical Contractors and Dealers for District No. 1 met at the

Imperial Hotel on Monday evening, February 10, 1919. The state of the association committee reported having held a conference and suggested certain rules to be followed by the committee in its work, and Mr. Green outlined a system of discounts that was based upon the quantity purchased which was thereupon discussed and explained, and the committee was instructed to proceed with their deliberations.

Under unfinished business the matter of the Friday page was discussed and upon motion it was decided to discontinue the page for the reason that not sufficient time could be given to editing it. The secretary was instructed to write the Abstract Record a letter thanking them for past favors.

Under new business the secretary reported having been approached by a Mr. McIntyre with the Own Your Home campaign who had asked that a committee be sent to interview in regard to submitting approximate costs on wiring the houses they intended building. The matter was referred to the Wiring Committee and the chairman, F. A. Bauman, instructed to call upon Mr. McIntyre at once.

The matter of issuing warrants for minor violations of the Electric Code and the question of fire alarm systems were referred to appropriate committees to be taken up more definitely at a later meeting.

A regular meeting of the society was held on March 10th at the same place. A number of important matters were considered, among them the specifications for fire alarm systems proposed by the wiring committee. The object was to eliminate the

vagueness of the present ordinance and to meet the real intention of the measure.

Mining Convention

An international mining convention is to be held at Vancouver, B. C., on March 17, 18 and 19. The meeting will attract a large representation of mining men from the northwest territory and from Alaska. A large attendance of Canadian mine operators and engineers is expected to be present. The speakers will include some of the leading mining engineers and experts of the United States and Canada.

A. S. M. E.—Western Sections

The western visit of Calvin B. Rice, president of the A. S. M. E., is to be the occasion of several pleasant gatherings in his honor. Mr. Rice plans to entertain A. S. M. E. members in the various cities through which he passes. The two western sections at Los Angeles and San Francisco are holding special meetings in his honor. He was the guest at the March 13th meeting of the Los Angeles section at Hotel

BUILDERS OF THE WEST—XLIX



JULEAN ARNOLD

The West, not content with building a vast empire of industrial, agricultural and commercial wealth for the lightening of human burdens within its confines, is today represented by its sons in distant lands of the Pacific to a degree that portends the early building of an even greater, more extensive and more helpful sphere of usefulness. To Julean Arnold, commercial attache to the great Republic of China, a young man of broad vision and of great potential force in development of helpful commercial interchange with our oriental neighbors, this issue of the Journal of Electricity is affectionately dedicated.

Clark. The address of the evening was "The Behavior of Steels Under Test" delivered by Prof. Ford of Throop University. The San Francisco section plans a special luncheon in honor of Mr. Rice at the Engineers Club on March 22.

California Association of Electrical Contractors and Dealers

Several meetings of the California Association of Electrical Contractors and Dealers have been held since the first of the year at which much important business has been accomplished.

The application of the Southern California Association for membership in the National and State Association was considered at the executive meeting on January 9th. After considerable debate the matter was settled on the following plan: That the contractors and dealers were to form themselves into a section on the basis of annual dues at the rate of \$2.00 per each one thousand dollars' worth of business done in 1917, and that all members of the State Association base their dues on the same plan.

A further resolution was made and carried that, should the 1919 business in any case be less than 1917, credits were to be extended.

The invitation of the president of the Pacific Coast Section N. E. L. A. to hold the second quarterly meeting of the association jointly with them at Coronado late in April or early in May was accepted, and every section of the state was requested to be represented. At a later meeting C. L. Chamblin, R. V. Oyler, G. E. Arbogast, T. J. Bennett and F. J. Somers were appointed on the committee to cooperate with the N. E. L. A. in this convention.

H. C. Reid presented his resignation from the Advisory Board of the California Electrical Cooperative Campaign Committee which was reluctantly accepted and the Advisory Board was requested to send a nomination to the executive committee as to a successor.

At the members' meeting of January 10th at Sacramento the following resolution was adopted after some discussion of the report of the special committee on supplies:

"That the Committee on Supplies is hereby instructed to enter into negotiations with a committee of the Supply Jobbers to the end that every effort be exerted to raise the standard of the industry to its most efficient point. That the Committee on Supplies be at all times under the direction of the Executive Committee."

The proposed amendment to the By-Laws relegating the president of the association to the office of State Representative was overwhelmingly defeated.

The question of preparing a pocket data book was taken up and the support of the members pledged.

H. C. Reid as retiring president was presented with the thanks and remembrance of the association and a token of their esteem in the form of a Hoover vacuum cleaner.

At the Retail Dealers' meeting, a plan of getting greater results from the work of the field agents of the California Electrical Cooperative Campaign was taken up. It was felt that the field men should advance new ideas along the lines of window dressing, also new ideas on merchandising, assist in planning of advertising, make investigation and reports on general resales, and if possible suggest new ideas on store arrangement as well as general market conditions existing in the territory.

They also felt that the field men would accomplish greater results if they, upon entering a field, would first call a meeting of all electrical merchants and explain their endeavors. In this manner it is believed that both the merchants and the field men would receive valuable suggestions.

It was suggested that the Executive Committee make preparations for a merchandising section to meet at each quarterly section.

A most enjoyable dinner was carried out by the Oakland and Berkeley members of the association at the Hotel Oakland on February 19th.

The San Francisco Electrical Development League

Perhaps the most helpful meeting ever undertaken by the San Francisco Electrical Development League was that of Monday, March 10, 1919, at the Palace Hotel luncheon. The meeting was given over to a discussion of the Master Electricians enactment now before the California legislature, known as Senate Bill No. 570. The meeting was largely attended and representatives from all branches of the industry were present in great numbers. The discussion lasted for four solid hours. The bill as discussed is printed in full below.

The trend of the discussion was unquestionably favorable to the passage of some bill that would enable inspection of electrical installation to become standardized throughout the state. It was felt that the bill as it stands confers too much power on the accident commission, especially in its authorization of the commission to revoke licenses without showing cause for action. The departments of electricity from several municipalities in the San Francisco bay region thought the bill should be corrected similar to the boiler inspector's law as now in vogue in California, wherein all existing machinery of inspection in the state is taken advantage of in putting into effect the provisions of the law. It was also emphasized that the powers of the commission should be centered more in specific rules for installation rather than the granting of general powers of supervision.

The following committee was appointed to go before the accident commission and the judiciary committee of the California legislature, to present arguments for remodeling the proposed enactment, or even to propose delay in its passage for a two year period, if deemed advisable:

S. J. Lisberger, chairman, electrical engineer, Pacific Gas & Electric Co.
C. F. Butte, president Butte Engineering & Construction Co.
W. S. Berry, western sales manager, Western Electric Co.
Leon Van Atta, Pacific States Electric Co.
J. F. Pollard, commercial department, Sierra & San Francisco Power Co.
E. O. Shreve, San Francisco manager, General Electric Co.
M. A. De Lew, president Cal. Ass'n Electrical Contractors and Dealers

The bill as it now stands in the California legislature is as follows:

An act to provide for the inspection of electrical work and electrical equipment, and to regulate the manner of installation of all devices used for the generation and consumption of electrical power in places of employment in this state; and to provide for establishing standards of electrical construction in such places: requiring a permit to be issued by the industrial accident commission for the use of electrical equipment and devices, making it a misdemeanor to use such equipment and devices without such permit; allowing an injunction against such use without such permit where dangerous to the life and safety of employees; providing for a hearing before the industrial accident commission before the refusal of said permit; providing for the qualification and appointment of inspectors and prescribing maximum fees for inspections, and providing for the licensing of master electricians and the collection of a fee for such licenses.

The people of the State of California do enact as follows:

Section 1. The following terms, as used in this act, shall, unless a different meaning is plainly required by the context, be construed as follows:

(1) "Industrial accident commission" and "commission" means the Industrial Accident Commission of the State of California.

(2) The term "place of employment" shall mean and include every place, whether indoors or out or underground, or elsewhere, and the premises appurtenant thereto, where, either temporarily or permanently, any industry, trade, work or business is carried on, or where any process or operation directly or indirectly related to any industry, trade, work or business, is carried on, including all construction work, and where any person is directly or indirectly employed by another, but shall not include any place where persons are employed solely in household domestic service, or any place of employment, concerning the safety of which jurisdiction may have been vested by state law in any other commission or public authority, and this act shall apply to such places of employment.

(3) The terms "equipment" and "electrical equipment" mean and include any and all electrical machinery, apparatus, appliances, devices, fixtures, fittings, materials, wires, cables, conductors and poles, pole lines for the transmission and distribution of electric power or energy for lighting, heating, power, mechanical or other purpose.

(4) The term "electrical work" means and includes the installation, construction, erection, connection, alteration and repair of any and all electrical equipment.

(5) The term "master electrician" shall be taken to mean an individual, a firm, a partnership or a corporation engaged in doing electrical work in this state.

Sec. 2. All electrical equipment in places of employment shall be so constructed, installed, operated, maintained and repaired that said electrical equipment will be safe and free from risk or danger of accident or injury to employees by fire, shock or otherwise.

Sec. 3. No electrical equipment shall be used in a place of employment without the written permit of the industrial accident commission for using such electrical equipment, and unless such permit shall remain in full force and effect. The use of such electrical equipment without such

permit shall constitute a misdemeanor, and each day of violation of the provisions of this section shall constitute a separate offense, provided, that no prosecution shall be maintained where the issuance or renewal of such permit shall have been requested and shall not have been acted upon. Whenever any electrical equipment is being used, without the permit herein required, and is in condition or is making conditions in places of employment dangerous to the life or safety of any employee employed or to be employed in any place of employment, the industrial accident commission, a commissioner or any person affected thereby may apply to the superior court of the county in which such place of employment is located for an injunction restraining the doing of electrical work or the installation or use of electrical equipment until such condition shall be remedied or removed. Proof by certification of the commission that such permit has not been issued, together with the affidavit of any electrical inspector of the commission that the conditions are, or will be, dangerous to the life or safety of any employee shall be sufficient ground for the immediate granting of a restraining order, for the granting of which no bond shall be required from the commission.

Sec. 4. The industrial accident commission shall cause inspection to be made of all electrical equipment in places of employment, and if conditions be found, upon such inspection, to be safe, as provided by the laws of the State of California and the orders of the industrial accident commission, a permit shall be issued by said commission for the use of said electrical equipment, which said permit shall be in full force and effect while said electrical equipment is being used, unless revoked for good cause. If such inspection shall show unsafe conditions the commission or a commissioner may issue a preliminary order containing such requirements as shall make safe conditions, and may order the use of electrical equipment to cease until any unsafe condition has been removed or remedied. Unless such preliminary order be complied with, a hearing before the commission, a commissioner or referee of such commission shall be allowed, upon request, at which all parties affected shall have an opportunity to appear and show cause why compliance with said preliminary order should not be made. If it shall thereafter appear to the commission that said preliminary order should be complied with, or that other things should be done to make such conditions safe, the commission may order the withholding of the permit to use such electrical equipment, and make such requirements as it finds proper for the correction of such unsafe conditions. Such order may thereafter be reheard by the commission or reviewed by the same courts and in the same manner as specified by the workmen's compensation, insurance and safety act of 1917 for safety orders, and not otherwise.

Sec. 5. Inspections herein provided for shall be made only by inspectors of the industrial accident commission or by inspectors employed by a city, city and county or county who hold certificates of competency issued by the commission. Such certificate may be issued by the commission after examination or other test of the qualifications of any person to make the inspections herein provided for, and may be revoked or suspended by the commission at any time. No charge shall be made for the issuance of such certificate of competency. No such certificate of competency shall be issued by any inspector of a city, city and county or county unless such city, city and county or county has adopted electrical safety standards equal to the minimum safety standards adopted by the commission.

Sec. 6. Nothing contained in this act shall be construed as a limitation upon the authority of the industrial accident commission to prescribe or enforce general or special safety orders. Said commission shall have power, authority and jurisdiction, upon following the procedure prescribed for the making and entering of general and special safety orders, in the workmen's compensation, insurance and safety act of 1917, to make and enter both general and special safety orders establishing standards for the performance of electrical work and for the installation and use of electrical equipment in all places of employment in this state, and such general orders and special orders shall have the same force and effect as is established by law with respect to the general safety orders and special safety orders made and entered under the safety provisions of the workmen's compensation, insurance and safety act of 1917.

Sec. 7. It shall be unlawful for any electrician, or any other person, to do electrical work, other than minor operating repairs, in places of employment, without a master electrician's license, provided this section shall not apply to any electrician directly employed by a master electrician.

Sec. 8. Every application for a master electrician's license shall be made in writing, in such form and detail as shall be prescribed by the commission, and in addition to any other information that may be required shall state the name and business address of the applicant and shall contain a statement that the applicant agrees that in the conduct of the business of doing electrical work he shall be subject to, and will faithfully comply with, all safety orders issued by the commission. The master electrician's license shall extend to cover electrical work by the holder of the license and any immediate employee of the holder, in good faith, who is working for and under the direction and supervision of the master electrician holding such license.

Sec. 9. A master electrician's license shall entitle the holder thereof, for a period of one year, unless sooner revoked, or suspended, to engage generally in the business of doing electrical work, but such license may be suspended or revoked for any violation of any law enacted for the safety of employees in places of employment, or of any general or special safety orders issued by the commission for safety in places of employment, or for any other cause deemed to be good and sufficient by the commission. The holder of a license shall be responsible for all work done and acts performed thereunder, and it shall be unlawful to lend or transfer said license.

Sec. 10. A license tax of twenty-five dollars shall be paid in advance to the industrial accident commission for every master electrician's license issued hereunder. Such license tax shall be paid into the "accident prevention fund."

Sec. 11. Within forty-eight hours, exclusive of Sundays and legal holidays, after the installation of any electrical equipment the master electrician shall give notice to the commission, in manner and form prescribed by it, that said equipment is ready for inspection.

As soon after receipt of any such notice as is reasonably practicable, the commission shall cause an inspection to be made of such electrical equipment. If it shall be found that said work has not been done in conformity with safety laws and the safety orders issued by the commission, the commission shall condemn the same by withholding approval thereof, and shall give notice of such action to the master electrician, which notice shall state wherein the equipment or other work does not meet such requirements.

Within ten days after such notice, or within such further reasonable time thereafter as may be prescribed by the commission, said master electrician shall correct such installation or other work in all particulars wherein it shall have been found not to meet said requirements, and he shall immediately notify the commission when such correction shall have been made. The failure, neglect or refusal of such person to do so shall be deemed sufficient cause for the commission to refuse, and it is authorized and empowered to refuse, to issue the permit for the use of such electrical equipment until said installation or other work shall have been corrected and inspected and found to conform in all particulars with safety laws and safety orders.

Sec. 12. The industrial accident commission may fix and collect such fees for the inspections herein provided for as it may deem necessary, not to exceed ten dollars for the inspection of any one unit of electrical equipment and, within the limits set forth in this section, may devise a fee schedule to cover the details of inspection and may charge and collect fees for inspections according to such schedule, provided that no inspection fee shall be charged or collected by the commission under this act for inspections made by inspectors employed by a city, city and county or county who hold certificates of competency. Such fees must be paid before the issuance of a permit for the use of electrical equipment. All fees collected by the commission under this act shall be paid into the "accident prevention fund."

Sec. 13. This act shall be effective January first, nineteen hundred twenty.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section

Chairman—J. H. Cunningham, General Electric Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section

Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittcock Block, Portland, Ore.
Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.
Meetings—Monthly.

Denver Section

Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section

Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—T. C. Smith, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. E. McMahon, University of California, Berkeley, Cal.
Secretary—D. D. Davis, University of California, Berkeley, Cal.

University of Colorado Branch

Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.
Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Montana State College Branch
Secretary—J. A. Thaler, Montana State College,
Bozeman, Mont.
Meetings—Third Friday of every month of the
school year in the Electrical Bldg.

Throop College of Technology Branch
Chairman—Mark Sawyer, Throop Dormitory,
Pasadena, Cal.
Secretary—Russell Otis, Throop Dormitory, Pas-
adena, Cal.

State College of Washington Branch
Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of
Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg.,
Pullman, Wash.

CONTRACTOR-DEALER ASSOCIA- TIONS

National Association of Electrical Contractors and
Dealers

Chairman—W. Creighton Peet.
Secretary—W. H. Morton, 110 West 40th St.,
New York.
Executive Committeemen-at-Large—W. D. Kohl-
wey, California; Executive Committeemen,
Pacific Division—J. R. Tomlinson, Portland,
J. F. NePage, Seattle, Wash.

British Columbia Ass'n Electrical Contractors and
Dealers

President—E. Brettell, Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver,
B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and
Dealers

President—M. A. DeLew, 180 Jessie St., San
Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San
Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San
Francisco

President—C. L. Chamblin, 641 Mission St., San
Francisco.
Secretary—J. Stewart, San Francisco.
Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and
Dealers

President—G. E. Arbogast, 724 So. Olive St.,
Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty
Bldg., Los Angeles, Cal.
Meetings—Every Friday at 5:30 p.m. at the
Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and
Dealers

President—F. V. McAvoy, 138 N. Canter St.,
Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and
Dealers

President—R. C. Kenney, Portland.
Secretary—J. Willis Oberender, 301-2 Dekum
Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors
and Dealers

President—J. H. Sroufe, Jagg'r-Sroufe Co.,
Portland.

Sacramento Section, California Electrical Contrac-
tors & Dealers' Association

President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co.,
70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co.,
37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial
Club.

Washington Ass'n of Electrical Contractors and
Dealers

President—V. S. McKenny, NePage & McKenny
Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings—Quarterly—second Thursdays of
March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So.
Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Com-
pany, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San
Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Sup-
ply Co., 304-12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San
Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign

Chairman Advisory Committee—L. H. Newbert,
445 Sutter St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San
Francisco.

National Electric Light Association

President—W. F. Wells, Edison Elec. Illuminat-
ing Co., Brooklyn.
Executive Secretary—T. C. Martin, 33 W. 39th
St., New York City.

Nevada Section, N. E. L. A.

Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.

President—Samuel Kahn, Western States Gas &
Electric Co., Stockton, Cal.
Secretary—A. H. Halloran, Journal of Electric-
ity, Crossley Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.

Chairman—H. H. Schoolfield, Pacific Power &
Light Co., Portland.
Secretary—F. H. Murphy, Portland Railway,
Light & Power Company.
Mar. 11—"Work of the U. S. Engineer Depart-
ment," by Col. Geo. A. Zinn.

Illuminating Engineering Society

President—George A. Hoadley.
Secretary—Clarence L. Law.
Western Representatives—Romaine Myers, Bacon
Bldg., Oakland, Cal.; C. M. Masson,
Edison Bldg., Los Angeles; F. H. Murphy,
Portland Railway Light & Power Company,
Portland, Ore.; W. R. Putnam, Utah Power
& Light Company, Salt Lake City; Fred
A. Osborn, University of Washington, Seat-
tle, Wash.
Meetings—First Tuesday each month.

New Mexico Electrical Association

President—James R. Smith, Raton, N. M.
Secretary—Charles Twogood, Albuquerque, N.M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association

President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg.,
Dallas, Texas.

Northwest Electric Light and Power Ass'n

President—H. J. Gille, Puget Sound Traction
Light & Power Co.
Secretary—W. E. Herring, Puget Sound Traction,
Light & Power Co.

Meetings—Convention held annually. Executive
Committee, governing body of Association,
meets upon call of its chairman.
New officers announced later.

Los Angeles Jovian Electrical League

President—A. E. Peat, San Joaquin Light &
Power Corp.
Secretary—Frank Weiss, Los Angeles Gas &
Electric Corp.
Meetings—Every Wednesday, 12 m.
Feb. 26—"The Labor Situation," by Sen. Geo.
W. Cartwright.
Mar. 5—"Harbor Development," by Clarence
H. Matson.

San Francisco Electrical Development League

President—Garnett Young, 612 Howard St., San
Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San
Francisco.
Meetings—Every Monday, 12:10 p.m.; lunch-
eon, Palace Hotel.

Electric Metermen's Association

President—J. E. Bridges, Westinghouse Electric
& Manufacturing Company.
Secretary—A. E. Coney, Great Western Power
Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club

President—George Drew, Pacific States Electric
Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas &
Electric Company, Oakland, Cal.

Synchronous Club

Secretary—H. N. Beecher, City Hall, L. A.
Mar. 11—"Oxy-Acetylene Welding," by LeRoy
Andrews.

Telephone and Telegraph Society of the Pacific
Coast—San Francisco Section

President—W. H. Brameage, Pacific Tel. & Tel.
Co., San Francisco.
Secretary—Chas. H. Dodson, 835 Howard St.,
San Francisco.

MECHANICAL ENGINEERS

National Officers

President—Mortimer E. Cooley, Electrical Engi-
neering Dept., Ann Arbor, Mich.
Secretary—Calvin W. Rice, Engineering Society
Bldg., New York City.

San Francisco Section, A. S. M. E.

President—E. C. Jones, Pacific Gas & Electric
Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg.
Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the
Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.

President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers

Secretary—Orrin E. Stanley, Box 973, Portland.
Meetings—Annual: Feb. 4, 1918. Monthly:
Third Thursday of each month.

The Engineers' Club of Seattle

President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg.,
Seattle, Wash.
Meetings—Thursday noon at the club rooms at
410 Arctic Bldg. A buffet luncheon is served
every day. A special welcome is extended to
all engineers visiting the city.

Engineers' Club of San Francisco

President—A. E. Chandler, New Call Bldg.,
San Francisco.
Secretary—J. R. Brownell, 525 Market St., San
Francisco.
Annual Meeting: October.

Idaho Society of Engineers

President—W. H. Gibson, Mountain Home,
Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland

President—R. S. Chew, Oakland Chamber of
Commerce, Oakland.

Engineers' Club of Sacramento

President—George S. Nickerson, 914 Forum
Bldg., Sacramento.
Secretary—P. M. Noebbe, State Department of
Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco

Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San
Francisco.

Joint Committee Technical Societies of Los An-
geles

Chairman—George A. Damon.
Secretary—W. K. Barnard, 705-6 Central Bldg.,
Los Angeles.

MISCELLANEOUS

American Ass'n for the Advancement of Science—
Pacific Division

President—D. T. MacDougal, Director Desert
Laboratory, Carnegie Institution, Tucson,
Arizona.
Secretary (acting)—J. R. Douglas, 430 Library,
University of California, Berkeley, Cal.
Meetings—Annual.

Portland Section A. S. C. E.

President—P. H. Dater, Eng. U. S. Forestry
Service.
Secretary—C. P. Keyser, Park Bureau, Port-
land, Oregon.
Meetings—At call of president.

Spokane Engineering & Technical Ass'n

President—J. C. Ralston, E. M., E. E.
Secretary—A. D. Butler, City Engineer, Spo-
kane, Wash.
Meetings—Third Friday of each month. Joint
with A. S. C. E., A. I. E. E. and A. S. M. E.

Foreign Trade Club

President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San
Francisco. Every Wednesday evening.

Pacific Coast Gas Association

President—John D. Kuster, care Pacific Gas &
Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San
Francisco.

Society for Promotion of Engineering Education

Secretary—F. L. Bishop, University of Pitts-
burgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

TRADE NOTES

Sales Convention —

Fifteen Delco Light dealers of the Northwest, representing the Modern Appliance Company, 508 First avenue South, Seattle, which in turn represents the Domestic Engineering Company at Dayton, Ohio, are visiting Dayton for the purpose of attending the sales convention and for the further purpose of visiting the factory of the Domestic Engineering Company and familiarizing themselves with the new products. The fifteen delegates now attending the convention have sold sufficient Delco products to entitle them to a free trip to Dayton. These products are being extensively utilized in lighting up the dark places on the farm. Among those attending the convention are: E. H. Epperson, president of the Modern Appliance Company, Seattle, G. E. Thompson, King county representative, R. Marsh of Kamloops, B. C., H. J. Cressup of Vancouver, Wash., Charles E. Flagg of Spokane and H. A. Conger of Portland.

New Business —

The Standard Electric Company, 73 Horton street, Seattle, has just finished wiring an apartment house at Bel-lingham, Washington, for J. G. Hull at the contract price of \$1200.

Change of Office —

The main office of the Stockton Electric Railroad Company will hereafter be at 65 Market street, San Francisco, instead of in Los Angeles.

Expansion of Business —

The Western Dry Battery Company, manufacturer of Bull Dog Dry Cells, has moved into its own two-story factory at 15th avenue West and Wheeler street, Seattle. This company began business in Seattle six years ago and has grown and expanded until the product is now sought throughout the western states and in Hawaii. The new factory has 6500 square feet of floor space. James Bennett is president and Roy Bennett manager of the company.

An Electric Service Station —

F. S. Williams and D. L. Manning have opened an electric and car service station in the D. L. Brown building, Pomeroy, Wash. The second floor has been remodeled and will be used for a display room; the first will be used as a repair shop. A large dynamo is being installed for the recharging of storage batteries. Outside wiring will also be done and the services of an electrical man of sixteen years' experience have been secured.

New Price Schedule —

A new price schedule affecting the entire line of General Electric wiring devices, except enclosed fuses and some similar material, has been announced under date of March first. The company decided that the only way immediately to remedy the present awkward system of meeting changing cost prices by reducing discounts, without making present catalogues obsolete, was to declare practically all list prices doubled and establish a new schedule of discounts from these doubled lists which gives the same net prices as are now in effect.

Union of Companies —

Arrangements have been made by The Franz Premier Company, the largest manufacturer of vacuum cleaners in the United States, with the General Electric Company, and also the Edison Electric Appliance Company, Inc., a subsidiary of the General Electric Company with headquarters in Chicago, for the formation of the General Vacuum Cleaner

Corporation. Headquarters of the new company will be in Cleveland and operations carried on at the present factory of The Franz Premier Company.

The new corporation has an authorized capital of \$10,000,000, a liberal portion of which will be held by the General Electric Company. Controlling interest will be held by The Franz Premier Company. The Edison Electric Appliance Company will receive an interest in the corporation in return for its vacuum cleaner business. Julius Tuteur, president of The Franz Premier Company, will be president of the new corporation. Associated with him will be eight directors, five of whom will be elected by The Franz Premier Company.

A New Montana Substation —

The Montana Power Company is building a new substation in Great Falls, located on First avenue North between 9th and 10th streets. It will handle the city distribution and being close to the center of distribution should improve the regulation on the system. Power will be supplied by the Black Eagle and Rainbow plants at 6600 volts. New equipment is being installed, and the modern equipment will be moved from the Black Eagle substation at the time of the cut-over to be made during the summer.

Personal Items —

James E. Barker of Los Angeles has opened offices at 611-615 Investment Building, Los Angeles, California, for the practice of gas, electrical and mechanical engineering.

C. R. Bach, Pacific Coast manager for the Manhattan Electrical Supply Company, returned recently from an extended trip through the Northwest including Montana, Idaho and Utah. He reports the business outlook as very bright.

LESSONS OF WAR COST FINDING

In a recent address, Wm. B. Colver, chairman of the Federal Trade Commission, tells of the lessons learned by the necessities of accurate cost finding which arose during the war. He says that from the experience of cost finding, he believes we may argue for:

- (1) Standardized accounting systems, suited to the various industries.
- (2) Cost and profit accounting for individual products.
- (3) Reasonable standardization of products and elimination of excessive costs due to unnecessary multiplication of styles and types.
- (4) Compilation and issue of current, basic trade information.
- (5) Conferences between industries and Government for the exchange of proper and useful views and information.

As for the outlook there need be foresight but no fear. A period of readjustment must be met with the new and broader view. The same cooperation of industry, of labor, of capital and of Government that armed the nation for war will make it still greater in peace.

SAN JOAQUIN LIGHT AND POWER DEVELOPMENT

To avert a serious power shortage and threatened curtailment of development in the San Joaquin Valley, the San Joaquin Light & Power Corporation, which plans in the next eighteen months to spend \$3,000,000 in betterments, and which applied to the California Railroad Commission for authority to make a 20 per cent increase in its base rates for electric energy, has been granted permission by the commission to add a 15 per cent surcharge to all bills, effective for all meter readings on and after Feb. 15, 1919, and for all flat-rate service after Feb. 1, 1919. The surcharge period, however, is limited to Jan. 15, 1920.

This proceeding is kept open and the commission retains jurisdiction to issue a supplemental order terminating such

surcharge whenever the revenues of the corporation shall be sufficient for the purposes specified.

The company has planned the development of a 15,000 kw. plant on the San Joaquin river, requiring an investment of \$1,750,000. Extension and improvements of its existing transmission and distributing system will cost \$1,250,000, or a total of \$3,000,000 to be expended in the next year and a half. The company expects to get most of this money through the sale of bonds. In its petition for rate increase it claimed that because of its failure to earn a full 8 per cent it could not meet its trust deed requirements as to issuance of bonds and therefore cannot obtain the necessary money to make extensions.

SIX MILLION GALLON PUMPING INSTALLATION

Thompson & Castleton, electrical engineers, 316 First avenue South, Seattle, will complete about April 1st an interesting electrical installation at Prineville, Oregon, for the Ochoco Irrigation District. The company found it necessary to rearrange and enlarge its electrical pumping equipment. The pumps are to furnish about 6,000,000 gallons of water per day for sluicing material required in making a hydraulic fill dam which is under construction, the electrical energy for which is obtained from the Deschutes Power Company of Prineville.

The original pumping plant consisted of two Worthington 3-stage, 10-inch centrifugal turbines, operating in multiple under a 225-foot head, discharging 6,000,000 gallons of water every 24 hours, and calls for 450 h.p. figured on a kva. basis. By replacing the dismantled impellers this plant would consist of two 5-stage, 10-inch turbines, operating in multiple under the greater head required of 375 feet, handling the same volume. However this would require 750 h.p. figured on a kva. basis and this was 300 h.p. in excess of the power to be obtained at the plant of the company. To meet this emergency an auxiliary pumping plant was installed at a point midway between the present pumping plant and a new sluicing pit, to operate the two plants alternately with the power available. This calls for construction of a reservoir at the site of the midway pumping plant.

From the site of the original pumping plant the two Worthington 3-stage, 10-inch pumps are being moved to the midway site as an auxiliary pumping unit and in their stead are being installed two D'Olier 12-inch centrifugal pumps, which will be driven by a 400 h.p. synchronous motor of the Electric Machinery type, the pumps being installed in parallel to deliver 8,000,000 gal. every 24 hrs. against a 185 ft. head. The auxiliary pumps at the middle point reservoir which are driven by a Westinghouse 450 h.p. motor, will serve to force water from the reservoir direct to the sluicing giants at the pit, 150 feet above. By following the plan of operating the D'Olier 8,000,000-gallon pump on Ochoco creek every other day and by alternating with the Worthington 6,000,000-gallon pump at the middle point reservoir, the reservoir will always contain an increasing supply of water for sluicing. It will be seen that the available 450 h.p. is utilized to operate both pumping units. The sluicing and dam construction will proceed at the rate of something like 1530 cubic yards a day.

OREGON LAWS AFFECTING THE ELECTRICAL INDUSTRY

Engineer's License Bill Passed —

The senate recently revised its former action on the house bill providing for the licensing of engineers and passed that measure with an amendment providing that army engineers shall be recognized as professional engineers within the meaning of the act and shall be licensed without examination within one year after their discharge from military service. The measure creates a board of engineering exam-

iners to consist of nine members to be appointed by the governor and provides that "After January 1, 1920, no person shall practice professional engineering without having first been duly and regularly registered by the board as a professional engineer as required by the senate act."

Regulating Practice of Architecture —

A bill authorizing and regulating the practice of architecture has been passed by the Oregon legislature with a slight modification. The bill as passed now provides that persons other than architects may prepare plans and specifications and build in accordance therewith but cannot call themselves architects or assume in any way the title of "architect."

State Payment of Interest —

An act to provide for the payment by the state of interest for a period of not to exceed five years on bonds heretofore or hereafter to be issued by irrigation or drainage districts has been passed by the Oregon legislature. The bill provides for the method of such payment of interest and repayment to the state of all moneys so paid, and for the investigation of irrigation and drainage districts by a commission.

Adequate Lighting Required —

An act has been passed by the Oregon legislature requiring owners, lessees and operators of places of employment to provide emergency and general natural and artificial lighting; defining how the minimum of light shall be established. It provides that all passageways and other portions of places of employment, and all moving parts of machinery which are not so guarded as to prevent accidents, where persons work or pass or may have to work or pass in emergencies, shall be kept properly and sufficiently lighted during working hours. All workrooms in any place of employment shall be properly and adequately lighted during working hours.

Lamps must be so located or suitably shaded as to minimize glare. All lamps and lighting appliances must be so installed in regard to height, spacing, reflectors or other accessories as to secure a good distribution of light on the work, avoiding objectionable shadows and sharp contrasts of intensity. Emergency lamps shall be provided in the main aisles and in all stairways, passageways and exits so as to afford sufficient guidance to provide the safe exit from said places of employment in case of emergency.

COMMERCIAL RELATIONSHIPS IN CHINA

A Letter to the Editor

Julean Arnold, commercial attache at Peking to whom this issue is dedicated, writes of some of the work which the American representatives are doing in China:

I am just returning to Peking after a year spent here in Shanghai as Chairman of the American Delegation to the China Tariff Revision Commission, another high sounding designation or appellation. The commission did not do all that the name tends to imply, but it did succeed in giving to China, as far as possible, an effective 5% import tariff. I had also while here the job of Field Representative and Organizer of the American Red Cross in China, which gave me an opportunity of doing a bit to help win the war, a small bit but a satisfaction, nevertheless. We have some, an ever increasingly larger number, of good Americans here in China and it's a pleasure to work with them. I managed also during the year I spent here to compile a commercial handbook on China, which is soon to be published by the Bureau of Foreign and Domestic Commerce of the Department of Commerce. I advise you to get a copy as I believe it will give you some information useful to your journal. There are a number of good articles in the handbook contributed by men who are specialists in their lines.

JULEAN ARNOLD.

LATEST IN EVERYTHING ELECTRICAL

(One of the largest hydroelectric developments in the West at the Holter Plant of the Montana Power Company and other advances during 1918 are described in a review of electrical apparatus during the year. The bulk of business done in ship wiring still continues and marine wiring devices are of special interest. The description of a new switch and an instrument panel especially designed for use in measuring gas flow are further presented in this survey. —The Editor.)

NEW INSTRUMENT PANEL FOR THOMAS METERS

The Cutler-Hammer Manufacturing Company of Milwaukee has recently completed an improved design of instrument panel for use with the Thomas Meter. The earlier panels carried both the recording instruments and regulating apparatus; and in order to make possible their installation in different locations, the Cutler-Hammer Company has now mounted the instruments on a separate small panel. The total and graphic records of the gas flow can therefore be placed, with a minimum space requirement, in the superintendent's office or near the operator interested in them, and the regulator can be located convenient for inspection by maintenance men. The meter housing is of course located at a point in the pipe line where a measure of the gas flow is desirable. In accordance with the modern trend of safety first ideas, further refinements have also been made in the design of the instrument panel to make it practically

fool-proof and shock-proof. The new design follows the dead front principle of switchboard construction, as the accompanying illustration shows. The top section contains the galvanometer which differs from the usual form of laboratory instrument in that the number of sensitive parts has been reduced to a minimum, and those sensitive parts that are necessary are made easily replaceable, while all other parts are made very strong and durable. The mechanism and connections are placed in an aluminum case and are arranged so that the sensitive parts are well protected but accessible. It is constructed jointly by the Leeds & Northrup Company and the Cutler-Hammer Company. Most forms of galvanometers are placed in wooden cases and are so constructed that they do not give good service when used by unskilled mechanics.

The middle section contains the Easterline graphic watt meter which records in standard units the flow of gas through the meter housing. Below the Easterline instrument is a Westinghouse single-phase watt meter, with scale calibrated for thousands of cubic feet of gas, which shows the total gas flow. Mounted on the back of the center section is a square D knife switch, operated by a lever on the front of the section, which serves as a main line switch for the heater circuit and all control circuits. At the left of this switch is mounted a push button control switch which operates a C-H single

pole remote control switch. This switch is magnetically opened and closed and mechanically locked and is used to open the heater circuit in the meter housing to permit the operator to balance the meter. The instrument panel also contains a current transformer, for all except the small size of meters, and fuses for the recording circuits and test connections for electrically testing the two watt meters. These watt meters are standard 5 ampere 110 or 220 volt instruments, hence they may be tested for accuracy in the same manner as any other standard indicating or integrating electrical instrument, that is, by connecting them in series with similar meters of known accuracy. Test constants are stamped on each meter and it is not necessary to shut off the gas or interrupt the gas measurement to test the recording and integrating instrument. All live parts are enclosed in the enclosing case upon which the sections of the panel are mounted and the complete panel is furnished with a case iron sub-base, necessitating no other work in installation than the mere lagging of the base to the floor.

NEW SQUARE D SWITCH

Extremely low price is an outstanding feature of the new switch known as the Ninety-Six Two Eleven, just put on the market by the Square D Company, Detroit, Mich. An investigation carried on by this company disclosed the fact that there is an enormous market for a switch of this type. This fact has led to production of the switch in large quantities, reducing manufacturing costs and resulting in a low selling price. The new switch is shown in the accompanying illustrations.

This No. 96211 is a 30 ampere, 125 volt switch, using Edison plug fuses. The current carrying parts are enclosed in a cabinet made of 16 gauge steel. The switch is operated by a handle on the outside of the box.

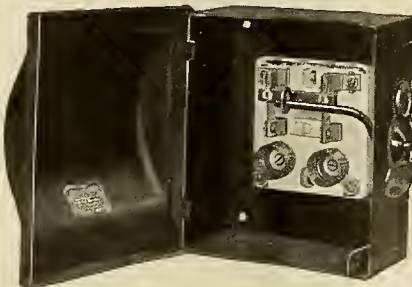
The box is equipped with a hasp so that the cover may be locked, preventing access to live parts by any except authorized persons. A lock-off device permits locking the switch in the "off" position when this becomes necessary.

Considering the great demand for building equipment at this time and the universal appeal of the Ninety-Six Two Eleven, the Square D Company anticipates that present facilities for manufacturing this switch will soon be outgrown. No. 96211 bears the combined fire and accident label of the Underwriters' Laboratories.

DEVELOPMENTS IN ELECTRICAL APPARATUS DURING 1918

A Survey by the Westinghouse Electric & Manufacturing Co.

During the past year, every effort has been made to utilize existing standards in order to meet the urgent demands of the war for unusual quantities of apparatus on short periods of shipment. As a result, there has been a marked



tendency to concentrate on the perfection of details of existing apparatus instead of bringing out new lines.

All manufacturers have endeavored to increase their productive capacities in so far as practicable, by elimination of special manufacture. However, the Government has had important problems to solve, and very gratifying results have been accomplished in conducting the required research and providing special machinery for their purposes.

Submarines—Distinct contributions have been made to this particular application during the past year in the instance of both motors and control. Motors have been developed, each consisting of two armatures mounted on a single shaft, two fields, and but a single frame. Improved insulation is an important feature. Equipment for controlling these main motors has been developed, this being of the pneumatic type.

Radio—Much has been accomplished in a comparatively short length of time in the development of generators and dynamotors for use with wireless telephone systems. The generators have been used on airplanes on the Western Front. They are of the wind-driven type, and have exceptionally small dimensions and weight. Dynamotors were developed both for the army and for the navy, and several thousand have been supplied. Noise, due to vibration, is minimized by mounting these machines in flexible cradles.

Undamped sending and receiving sets for radio telegraphy were developed for the U. S. Signal Corps, and were used for instructional purposes at the various training camps throughout the country.

Merchant Marine—The application of electric motors for driving auxiliary apparatus aboard the merchant ships prior to two years ago was very limited. The tendency to drive such machines electrically has rightfully increased during the past year. Special equipment for this exacting service is now being regularly supplied.

Steel Industry—One of the noteworthy features of recent practice is the selection of large size turbine units and a more liberal policy to provide for general plant electrification.

Arc Welding—Greater progress was made in the advance of electric arc welding during the past year than any other time. It had previously been quite generally used in the railroad shops of this country, but during the past year it was used more in manufacturing establishments using iron and steel, and in shipbuilding. The Welding Committee of the Emergency Fleet Corporation has been doing a large amount of work in promoting electric welding as applied to ships and although no rivetless ships were built in this country, a large one was completed during the past year in England which was entirely electrically welded, and there is now building a 250-ton ship in which riveting is being replaced by electric welding. Electric welding also made a large advance in the field where formerly gas welding was used, due to the fact that electric welding is cheaper, does the work faster and is very much less dangerous than gas welding.

Water-Wheel Generators—The installation of the Holter Plant of the Montana Power Company is one of the largest hydroelectric developments of the West. This plant includes four 12,000-kva. vertical water wheel type generators, making a total plant capacity of 48,000 kva. The voltage is stepped up through Westinghouse transformers to 100,000-volt transmission lines, and the output distributed among the mining and metallurgical companies in Montana, and the Rocky Mountain electrified division of the Chicago, Milwaukee & St. Paul Railway.

The Eastern Michigan Power Company has placed in operation this year the largest hydroelectric development in Michigan. It is located at Wellston, is called the Junction Development, and the power plant houses three 6250-kva., vertical, 30-cycle Westinghouse generators. The voltage is

stepped up to that of the transmission line, 140,000 volts, which is the highest voltage used in this country with the exception of one or two systems in Southern California.

CONNECTING BLOCK AND CARTRIDGE FUSE BASE FOR MARINE WIRING

The Bryant Electric Company of Bridgeport, Connecticut, who manufacture a comprehensive line of marine wiring devices, have ready for the market interconnecting blocks which are here illustrated and identified by catalogue Nos. 577 and 593.

These interconnecting blocks are made of unbreakable composition and provide means of making connections for branch circuits in junction boxes without the labor and difficulty of making soldered and taped tap-offs. The term-



inal plate binding screws are long and heavy and "staked" so that they cannot drop out and be lost. A center hole provides for wire entrance from the back of the box if necessary, and the large groove in the base permits wires to pass through under the block. The dimensions of the No. 577 are: diameter $1\frac{3}{4}$ inches, height 1 inch. The No. 593 block is $2\frac{1}{4}$ inches in diameter and 1 inch maximum height. Brass fastening screws 6-32 are furnished and kept in place by holding washers. Screw spacings are $1\frac{1}{2}$ inches on centers, which is standard on all Bryant marine devices. The cartridge fuse base catalogue No. 576, which is also made of unbreakable composition, provides a means of fusing a circuit in a regular four-inch junction box. Binding screws are amply long, "staked" so that they cannot drop out. The hole in the center provides for wire entrance to the back of the box. As will be noted, there is ample room between the fuses for additional circuits to pass through the box. Size 6-32 brass fastening screws are furnished and kept in place by holding washers. The holes for screws are $1\frac{3}{8}$ inches on centers, which is standard for all Bryant marine wiring devices. Dimensions of the fuse base are $3\frac{3}{4}$ inches diameter, $1\frac{1}{8}$ inches high. National Electrical Code Standard cartridge fuses are used in this block.

MARINE DEVICES

With the development of the ship building industry in America, the Benjamin Electric Manufacturing Company began to offer to ship builders a very complete line of marine lighting and signaling apparatus, most of it being water-tight and designed and made strictly for use under severe conditions aboard ship.

There is a line of water-tight marine lighting fixtures, both in deck and bulkhead installation. In addition to this the Benjamin Company is furnishing the merchant marine and navy with signaling apparatus, consisting of buzzers, bells and buttons all of water-tight construction. The Benjamin Company's wide experience in manufacturing lighting and signaling apparatus for oil refineries and flour mills qualifies them for the extraordinary demands for marine devices at this period. The Benjamin marine line is built up around certain basic parts in order to provide the uttermost interchangeability. Boxes, covers, globes and rings are standardized, and the spacings for supporting screws on receptacles and switches are in accordance with standard spacing of mounting bosses on various junction boxes and fixture bodies.

BOOKS AND BULLETINS

Usage of Quartz Mercury Vapor Lamps

A new publication of the Bureau of Standards, Scientific Paper 330, is entitled "The Decrease in Ultra-Violet and Total Radiation with Usage of Quartz Mercury Vapor Lamps."

In this paper experimental data are given on the decrease and intensity of the ultra violet and of the total radiation with usage of quartz mercury vapor lamps.

The measurements were made with a thermopile and a yellow (novial shade B) glass. Quartz mercury lamps, the Cooper-Hewitt, and the R. W. V. Lamp Company were examined.

It is shown that there is no marked difference in the per cent of ultra violet emitted by these lamps when new. The total intensity, as well as the ultra violet, decreases one-half to one-third in 1000 to 1200 hours.

Comparative data are taken on the ultra violet component in the radiations from the sun and from the quartz mercury vapor lamps; also data on the dye fading carbon arc lamp.

Test of Concrete Floor

Bulletin 106 of the Engineering Experiment Station of the University of Illinois gives the results of tests on a four-way reinforced concrete flat slab floor of the Western Newspaper Union Building in Chicago, Illinois, just before it was razed in 1917 to secure space for the present Union Passenger Station. The tests were conducted under the general supervision of Professor Arthur N. Talbot and the direct supervision of Harrison F. Gonnerman, Research Associate in Theoretical and Applied Mechanics in the Engineering Experiment Station.

Annual Report

The annual report to the stockholders of the Detroit Edison Company for the fiscal year ended Dec. 31, 1918, covers the general condition of the company, its financial report and a brief survey of the outlook for the coming year.

Reflectors for Outdoor Use

Bulletin 35 of the Reynolds Electric Company features Reco Reflectors for use with outdoor billboards and building signs.

Spanish Catalogue of Wiring Devices

The Cutler-Hammer Manufacturing Company of Milwaukee is distributing the 1919 edition of their Wiring Device Catalog written in Spanish. It lists and illustrates the majority of the C-H wiring devices shown in the 1919 English catalog. The Spanish catalog comprises 24 pages 8 by 10½ inches and is bound in a striking orange buff cover. It is intended for distribution to the Central and South American trade.

Industrial Gas Masks

The Bureau of Mines announces that it is making a preliminary investigation of gas masks with a view to establishing a list of approved devices for use in the mining and allied industries. After the preliminary investigation the Bureau will issue a schedule of tests which apparatus must meet in order to gain the approval of the Bureau of Mines. These investigations will be conducted at the Bureau's Pittsburgh Station by men who have had intimate connection with the development of mine rescue apparatus and gas masks used in warfare.

Boiler Logic

The Heine Safety Boiler Company, St. Louis, Mo., have just completed the printing of the latest edition of their

"Boiler Logic," an 86 page treatise on steam boilers. This treatise covers the following topics:

- I. Some Fundamental Considerations of Boiler Design.
 - (a) Furnace Design Requirements: Mixing, Time, Temperature.
 - (b) Heat Transmission from Fire by Radiation.
 - (c) Heat Transmission by Convection.
 - (d) Heat Transmission through tubes and to water.
- II. Practical Baffling of Water Tube Boilers.
 - (a) Flexibility of design.
 - (b) Leakage and cost of repairs and renewals.
 - (c) Active and inactive surface.
 - (d) Ease of cleaning soot and ash deposits.
- III. Heine Boilers for Different Fuels, Firing and Services.

Hand Firing with Bituminous Coal	Shavings and Refuse
Hand Firing with Anthracite Coal	Bagasse
Chain Grate Stokers	Gas Fired
Underfeed Stokers	Waste Heat Boilers
Oil Fired	Dredge Boat Boilers
- IV. Overloads.
- V. The Boiler as a pressure vessel.
- VI. Details of Construction, Heine Boilers.

Electrical Phenomena in Parallel Conductors

by Frederick Eugene Pernot, Ph. D., Associate Member A. I. E. E., Assistant Professor of Electrical Engineering, University of California, Captain Signal Reserve Corps, U. S. A.; 332 pp.; 83 illustrations; size 6 by 9 in. Published by John Wiley and Sons, Inc., New York and for sale at the Technical Book Shop, San Francisco.

Because of the considerable number of articles which have appeared here and there in the technical press for a good many years on the subject of the calculation of the electrical performance of long lines, it is a somewhat astonishing fact that a comprehensive book in the English language covering the calculation of such lines has not appeared long before 1918. It is gratifying, therefore, to find that a University of California professor has recognized the need for such a work and has produced an eminently satisfactory treatise on the subject.

It may be of interest to note the special quality of Dr. Pernot's book "Electrical Phenomena in Parallel Conductors" which, in the reviewer's opinion, sets it apart from and above the other writings which have appeared in this field. This quality is the masterly way in which the author has handled his mathematics. He has never allowed the physical and engineering aspects of the subject to become obscured by the mathematical treatment. Meanwhile, he has earned the gratitude of the reader by his full and careful development of the formulas. This is in pleasing contrast to the practice of some distinguished and mathematically inclined writers in the field of theoretical electrical engineering who are prone to substitute the good word "obviously" for much-needed elucidation. Nevertheless, Dr. Pernot quite naturally and properly presupposes that the reader has a working knowledge of the ordinary methods of the calculus and also of general alternating-current theory.

The author contends that "the aversion of the general engineering public to the hyperbolic function form of expressions (for the current and voltage at any point of a given line) is unwarranted." He contends also that the theoretically correct methods of handling the electrically long line involve no more mechanical labor than the so-called approximate methods of calculation. Both of these contentions are admirably well sustained by the arguments advanced in the book.

A striking feature of the book is the large number of accurately drawn curves and other figures illustrating the text. Another important feature is the excellence of the English used. Technical terms are clearly defined, and there is a noteworthy absence of ambiguous statements. On the other hand, the helpfulness of the book to the man who has occasional need to refer quickly to a special topic would be enhanced by the addition of an index. The omission of an index is the more readily forgiven, however, owing to the excellence of the table of contents. Within the latter, the section titles are self-explanatory to an unusual degree.

In the present volume, Dr. Pernot has given us a unique, useful, and exceedingly interesting book.

J. C. CLARK,
Associate Prof. Electrical Engineering,
Stanford University.

NEW ELECTRICAL DEVELOPMENTS

(The plans for new power development in the Pacific Central region involving work undertaken by irrigation districts, power companies and individuals, are undoubtedly the outstanding feature of this week's reports. Much industrial activity is reported from the Northwest as well as important projects under way in the Southwest and Inter-mountain Districts.—The Editor.)

THE PACIFIC NORTHWEST

OLYMPIA, WASH.—An appropriation has been made by the state senate for a preliminary survey of the Columbia river basin irrigation project.

MARSHFIELD, ORE.—The Bay Mill has installed a new shingle mill which will be operated electrically with current furnished by the Mountain States Power Company.

KLAMATH FALLS, ORE.—A bill has passed the legislature and has been signed by the governor providing for the drainage and irrigation of the Klamath marsh lands in Lower Klamath Lake.

OLYMPIA, WASH.—The public service commission has received new street car tariffs from the Washington Water Power Company of Spokane, serving notice that after March 25th the street car fare in Spokane will be seven cents.

SEATTLE, WASH.—The Allis-Chalmers Manufacturing Company, Seattle, is supplying a 40 h.p. motor to be installed in the gravel washing plant being erected at Steilacoom, Washington, by the Independent Asphalt Paving Company of Seattle.

ASTORIA, ORE.—The Pacific Power & Light Company will install one 3750 kva., 6600-volt, 3-phase steam turbo generator in the station at Astoria. The present steam boiler installation will be increased by 2000 h.p. in boilers. The new plant will represent an investment of \$400,000.

PORTLAND, ORE.—The national war labor board has awarded employees of the Portland Railway Light & Power Company a horizontal wage increase of 20 per cent above the scale effective October, 1917. The award also grants the eight-hour day to linemen, construction men and several other classifications.

VANCOUVER, B. C.—Plans are being prepared by the Canadian Pacific Railway Company for the construction of a coaling plant at North Bend. The company also contemplates building a power house at Smithers, B. C., to cost including machinery about \$25,000. F. W. Peters of Vancouver is superintendent.

YAKIMA, WASH.—Application is to be made to the state public service commission by the Yakima Valley Transportation Company to raise the fare on the company's city lines from 5 to 8 cents. The plan proposed includes also the sale of five tickets for 35 cents. The city lines, taking into account taxes and interest charges, showed a loss last year of about \$45,000.

SEATTLE, WASH.—Gray & Barash, electrical engineers, 63 Horton street, Seattle, have started erection on property belonging to them, a 34 by 93 foot foundry building for Doran Brothers' Brass Company, with plant on adjacent property. Doran Brothers have found it necessary to expand their works, owing to the fact of a contract that will require three years to perform, in making special bronze propellers.

CHEHALIS, WASH.—At the recent city commission meeting the petition of the Washington and Idaho Water, Light & Power Company for a franchise was again rejected on the ground that the law requires such petitions to contain not only the names of the signers but also their street addresses, and for the further reason that it did not bear an affidavit claiming each signer to be a legal resident of the city.

COLFAX, WASH.—Mayor Codd has outlined a plan to the members of the city council whereby the city with a small outlay of cash would be able to generate sufficient power for pumping the city water and to run an electric light plant to light the city streets. He recommended that members of the city council consider the question of putting the city steam plant into service and taking over the pumping of the water and lighting of the city streets.

SEATTLE, WASH.—Thompson & Castleton, electrical, hydraulic and mining engineers, 316 First avenue, South, are now engaged in rewinding a 1000 kva. steam turbine set for the Ferry-Baker Lumber Company of Everett, Washington, which was burned out March 1st. They also recently finished rewinding a 600 horsepower induction motor for the Puget Sound Bridge & Drudging Company, Seattle, which has a job of hydraulic work at Port Angeles, Wash.

SEATTLE, WASH.—Independent Asphalt Paving Company, Seaboard Building, Seattle, is installing a large gravel washing plant at Steilacoom, Washington, the electrical equipment for which is being furnished by Fairbanks & Company, 550 First avenue, South, Seattle. Included in the equipment is a 40 h.p. motor which operates a 36-inch Symonds disc crusher; 25 h.p. motor operating conveyor, and 40 h.p. motor operating a 1000-gallon centrifugal pump.

VICTORIA, B. C.—Six cent fares with transfer privileges have been put into effect in Victoria, B. C. The city has been notified by A. T. Coward, local manager of the British Columbia Electric Railway Company, that the company has agreed to accept the city's proposition with a few minor amendments and that if these concessions are granted by the council the company is ready to enforce the six cent fare charges and authorize transfers instead of the five cent fare charged at present without transfers.

SEATTLE, WASH.—The City council, against the advice of City Engineer A. H. Dimock, by a vote of five to four refused to make appropriation for work on the Skagit river at any point other than Gorge Creek, although the city engineer had stated that investigations must be made at Ruby Creek and Diablo canyon in order to determine the proper kind of development at Gorge Creek. The council struck from an ordinance appropriating \$35,000 for drilling operations on the Skagit river, \$15,000 to be used in making borings at Ruby and Diablo.

SEATTLE, WASH.—The supreme court of Washington has upheld the legality of the proposal of the city of Seattle to purchase for the sum of \$15,000,000 the street railway system of the Puget Sound Traction Light & Power Company. According to President Leonard of the traction company, there is no reason why the property should not be delivered to the city by April 1st. One of the first steps that will be taken after the traction deal is closed will be the acquiring of the lines of the Seattle & Rainier Valley Railway Company which has been under consideration for some time.

THE PACIFIC CENTRAL DISTRICT

HALFMOON BAY, CAL.—The Ocean Shore Railroad is planning to extend its line from the present terminal at Tunitas Glen to Pescadero, according to a report received here.

POINT ARENA, CAL.—The changing over of the local electric plant from steam to water power is under consideration.

BIGGS, CAL.—The trustees have decided to reduce the electric rate here from 8 cents to 6 cents per kilowatt hour. The system is owned by the municipality.

PLACERVILLE, CAL.—Extensive improvements will be undertaken by the Truckee River General Electric Company for the distribution of water for irrigation this season.

TRUCKEE, CAL.—A severe storm blocked the Truckee river during the last few days of February and there was not sufficient water to run the plant of the Truckee Light and Power Company. Consequently, Truckee was without electric lights for some time.

RIVERBANK, CAL.—The ranchmen of the immediate vicinity of Claus, located three miles south of Riverbank, are making ready to plant 1155 acres of rice this season. Nearly all the ranchers have installed from one to two pumping plants to assist in irrigating the crop.

ROSEVILLE, CAL.—The Dry Creek Rural Telephone Company's rural telephone line has opened for business with twenty subscribers. The line, which extends westward about six miles, was built as a cooperative line by the farmers and fruit growers of Dry Creek district.

WILLOWS, CAL.—The purchase of all of the properties of the Sacramento Valley West Side Canal Company and the Superior California Farm Lands Company in Glenn and Colusa counties is being considered by the farmers, and the organization of a Wright Act Irrigation District.

FRESNO, CAL.—The San Joaquin Light and Power Corporation and the Midland Counties Public Service Corporation will consolidate in the near future, according to announcement by President A. C. Balch of the Midland corporation before Railroad Commissioner H. D. Loveland.

SAN FRANCISCO, CAL.—R. T. Harding of San Francisco has applied for 30 cubic feet per second from Bucks Creek, Plumas county, tributary of North Fork, Feather River, for generating electric power for mining and manufacturing purposes. The total fall is 1400 ft., the total amount of power to be developed 4750 t.h.p.

FRESNO, CAL.—The erection of a dam across the Chowchilla immediately south of Bailey Flats has been decided upon by the East Bay Water Company of Oakland and D. C. Shelter of Los Angeles, to irrigate a 20,000-acre tract of land one and a half miles from Sharon. It is understood that the contract will be given to John S. Eastwood.

REDDING, CAL.—The Pit River Power Company has filed its articles of incorporation with the county clerk. It is capitalized for \$2,500,000. It is generally supposed that the company is subsidiary to the Southern Pacific, and that it is to develop electrical power for electrifying the railroad.

WOODLAND, CAL.—The only tidewater irrigation which has ever been used in California for the production of rice is to be tried this season by the California Hindustan Rice Company. A canal 2 miles in length is to be constructed from the Sacramento river to the northern end of the holdings of the company where large centrifugal pumps will be installed.

OAKDALE, CAL.—Frank B. Pattee, Oakdale, and Samuel Bernhard, San Francisco, with J. T. Ross of Astoria, Ore., have made application for 130 cubic feet per second of the water of the north fork of Stanislaus river in Calaveras and Trinity counties, for the development of power and electric energy. The total amount of power to be developed is 9600 t.h.p.

BRANDY CITY, CAL.—Pember S. Castelman has applied for 400 cubic feet per second of the north fork of Feather river, Yuba county, tributary of Feather river, for power purposes. Diversion works consist of a concrete arch dam 145 feet high, 400 feet long on top and 50 feet long on

the bottom, and a pipe line one mile long. The estimated cost of the proposed works is \$85,000.

SAN FRANCISCO, CAL.—Improvements costing \$232,500 are to be made on the Municipal Railways, according to a report filed with the Board of Public Works. It is planned to spend \$165,000 for twenty new cars of a design now being perfected by the engineering department and the remainder for construction of a block of track on Union street, from Franklin street to Van Ness avenue.

WOODLAND, CAL.—The local manager for the Pacific Gas and Electric Company announces that prospects for 1919 are particularly bright. An additional 3000 horsepower load for irrigation is to be distributed in the county. The Alameda Sugar Company has also given notice that several pumping plants will be added and that a much larger acreage will be planted during the year to sugar beets.

FRESNO, CAL.—Delegates from nine of the districts interested in the Pine Flat dam and irrigation project met in the Fresno city hall with the Kings River Conservation Association to discuss the much agitated problem of uniting all the water districts for the purpose of putting through the big nine-million dollar Pine Flat reservoir project, which would place 400,000 more acres under irrigation.

WILLOWS, CAL.—The rice industry in this county is making a bid demand on the Northern California Power Company this year for additional current. Over fifteen hundred horsepower is asked for by new individual pumping plants alone and the greater part of these are located on lands in this vicinity. This extra load will necessitate the building of a substation in this city by the company, it is stated.

GRIDLEY, CAL.—The Sutter Butte Canal Company, of Gridley, ask for 500 cubic feet per second of the water of Feather river, Butte county, for the irrigation of 5000 acres of agricultural lands in Sutter county. The applicant proposes to install a pumping plant on Feather river to be operated by electricity or other power for the purpose of ultimately pumping 500 cubic feet per second from Feather river. But one unit of the plant will be constructed at present.

OAKDALE, CAL.—F. B. Pattee and Burton Smith, former district irrigation engineer, have asked the Oakdale Irrigation District to join in filing with them upon water rights on the north fork of the Stanislaus river. The plan outlined is to develop from ten to fifteen thousand horsepower by constructing a power house and storage reservoir on the Stanislaus just above the Utica Mine plant and to take the electricity thus generated to San Francisco and Stockton and cities along the route.

SACRAMENTO, CAL.—An election has been called to vote on the proposal to issue bonds for the construction of a new filtration plant, to cost with machinery and equipment, \$1,200,000; wharf and warehouse, \$150,000, and incinerator plant \$143,000. If the project is carried through considerable electrical and mechanical equipment, including motors, hoisting and conveying apparatus and general transmission machinery, will be required. The proposed work will be in charge of the city engineering department.

FRESNO, CAL.—The San Joaquin Light & Power Corporation has asked for all the water of the north fork of the San Joaquin river in Madera county not now in use, not to exceed 50 cubic feet per second, between the months of March 1st and December 1st of each year, for the generation of electric power for agricultural, manufacturing, oil well pumping, lighting and domestic uses. The appropriation involves no diversion from the North Fork but contemplates the flow of all the water down said North Fork to applicant's Crane Valley reservoir.

FRESNO, CAL.—The San Joaquin Light & Power Corporation announces the immediate expenditure of \$1,750,-

000 for the construction of another large power house on the San Joaquin river. The new plant will have an output of 20,000 horsepower and work is being rushed to complete it within one year from the present date. The new power house will be known as San Joaquin Plant No. 6. It will be situated on the main San Joaquin river near what is known as Macy Flat, about six miles below the present big power house.

TULARE, CAL.—The Mt. Whitney Power and Electric Company has begun work on improvements and changes in the local system which will amount to \$82,000. Of this amount \$60,000 will be expended in extending its power lines to accommodate the increasing demand of ranchers for power for pumping plants. Another \$17,000 will be spent in converting the Tulare lines now on a two-phase 6600-volt system to a three-phase, 11,000-volt system. Five thousand dollars will be spent in adding two transformers to the substation in this city.

COLUSA, CAL.—The work of moving the Pacific Gas & Electric Company substation from Knights Landing to Wilkins Slough in Colusa county is now under way. The plant will be used for the purpose of pumping water for a large acreage in the Sutter Basin and about 5000 acres in Reclamation District No. 108. The land in lot 108 will be planted in rice and the land in the Sutter Basin will be planted to beans. As soon as the material can be assembled, it is stated that the Pacific Gas & Electric Company will begin the erection of a new substation building for the Knights Landing district.

THE PACIFIC SOUTHWEST

CALEXICO, CAL.—Joseph M. Berkeley, engineer from Los Angeles, has presented statistics and estimated cost on a municipal gas and electric plant for Calexico.

SAN DIEGO, CAL.—San Diego Consolidated Gas & Electric Corporation is erecting a 20,000 cubic foot gas holder at Escondido which, with the 10,000 cubic foot holder located there, gives the district a storage capacity of 30,000 cu. ft.

SAN BERNARDINO, CAL.—Application has been made to the board of supervisors of San Bernardino county for a 50-year franchise, to lay and operate a system of gas pipe lines and appliances, etc., within the county.

LOS ANGELES, CAL.—The San Joaquin Light and Power Corporation, Los Angeles, announces dividend No. 17 of \$1.50 per share on the preferred stock was declared Feb. 13 to stockholders of record February 28, 1919, payable March 15.

LOS ANGELES, CAL.—Adding the gross operating revenue of the Los Angeles Gas and Electric Company, the income receipts and profits on sales of bonds of the Pacific Lighting Corporation, the holding company, the combined gross income for 1918 was \$5,038,324, according to the report of the president.

SAN DIEGO, CAL.—Plans have been prepared by the Navy Department for the installation of a new floodlighting system at the naval coaling station at La Playa. The system, it is understood, will consist of high-power projectors with wires running to the lamps from the local power plant in submerged concrete conduits.

SAN DIEGO, CAL.—Construction work on San Diego's \$5,000,000 Marine Brigade Post will be started about April 15th. Bids have been received for construction of the first group of seven barracks. Reclamation of a site embracing 732 acres will be completed by the latter part of March. Seventy-five acres are now available for construction work.

LOS ANGELES, CAL.—A 2,000,000 project for supplying water to 30,000 acres of land lying west of Los Angeles, including annexed districts of Sawtelle, Plam and Westgate and also Santa Monica, was outlined by Chief Engineer William Mulholland of the water department at a conference a few days ago. The proposition contemplates the creation

of a water district covering the area referred to, such a district to vote the necessary bonds. An auxiliary trunk line will be built from San Fernando reservoir at the lower end of the aqueduct across San Fernando valley to the Westgate district, and a distributing system to be installed for both irrigating and domestic use. An estimate of the cost is about \$1,950,000.

THE INTER-MOUNTAIN DISTRICT

BOISE, IDA.—Permission to charge a seven cent fare has been granted the Boise Railway Company by the public utilities commission.

LAMAR, COL.—The town officials have petitioned the State Public Utilities Commission for permission to establish a municipal electric light plant.

CUTBANK, MONT.—Preliminary plans have been completed by Joseph Seal & Son for the installation of an electric light plant in Cutbank. If the franchise is approved by the council, work will soon begin on the proposed plant.

MOSCOW, IDA.—E. C. Hall is preparing to open a general electric shop here. He will make a specialty of automobile work of all kinds and will handle the Willys-Knight line of high class electrical automobile supplies as well as other standard kinds.

KALISPELL, MONT.—Kalispell has granted a new contract for electric street lighting to the Mountain States Power Company which is to run for 35 months, and for each cluster of four 60-watt lamps the cost is to be \$3.35 a month. Several new lighting districts will perhaps be created in the city in a short time.

WINNEMUCCA, NEV.—Representing a syndicate of local capitalists, John G. Taylor and Jerry Sheehan of Winnemucca have filed application to build a dam on the Humboldt river, near Stone House, for the purpose of storing 1000,000 acre feet of water. The water will be used to reclaim and irrigate 30,000 acres of alfalfa land near Winnemucca.

COEUR D'ALENE, IDA.—Preliminary work leading up to the \$100,000 job of widening and deepening the head of the Spokane river at Coeur d'Alene for the purpose of draining 25,000 acres of meadow lands in the Coeur d'Alene and St. Joe river valleys has been started. It is estimated the land, now practically worthless, will be made worth from \$50 to \$100 per acre.

LEWISTON, IDAHO.—Plans have been outlined by F. S. Rice, mining engineer, for a hydroelectric development on the Salmon river, 35 miles from Lewiston. Water rights have been secured by Mr. Rice at Horseshoe Bend in the Salmon river, and also authority from the government to tunnel through the bend and to construct a dam to divert the flow of the river.

MILES CITY, MONT.—In the report recently submitted to the city council by J. J. McGill, superintendent of the municipal electric light plant, an expenditure of about \$45,000 for improvements to the electric plant is recommended. New equipment, including an ash-conveyor, two new boilers with stokers or self-feeding apparatus and a 500 kw. generator with turbine engine, is necessary to meet the requirements for additional service.

HELENA, MONT.—Upon the ground that the street car fares granted to the Helena Light & Railway Company by the state utility commission are inadequate to enable the company to operate except at a loss, and that it lost \$54,477.64 in the operation of the street car system in 1918, O. W. McConnell, manager of the company, has applied to the commission for further increases. He asks for a ten cent fare or three tickets for a quarter within the city limits and to some points outside, and a proportionate rate to other points outside the city.

THE VACUUM CLEANER

THE VACUUM CLEANER

A FIXED ENTERTAINMENT is all very well, but no party can be a success without the casual contributions of the guests. This is the page where the readers run the program for the moment, under the lenient supervision of our electrical janitor who impartially gathers up odds and ends left about the office from the conversations of yesterday—and here offers you some of that variety which goes to make life interesting.—The Editor.



During fishing time it is strange how many engineering problems may arise to call these power company men into the mountains. This group, however, is said to attend strictly to business. They are the officials of the San Joaquin Light and Power Corporation.



poration at headquarters in Crane Valley. From right to left: A. Emory Wishon, assistant general manager; A. G. Wishon, general manager; E. A. Quinn, general superintendent; Emil Newman, engineer in charge of mountain construction work; H. H. Courtwright, manager Valley Electrical Supply Company.

Another one of those lineman's ditties which come to us from the Northwest:



HE BANE A SWADE

With a shuffling gait he stumbled in,
"Ah'm a boomer—a cook by trade;
But ah do some line work on the side."
And we thought, hay bane a Swade.

"Can you trouble shoot?" the boss inquired.
"Ay tank ay can," he replied,
"Ay's always on construction work,
But ay'm willin' ta bay tried."

He donned the hooks like a new born babe.
It would make you laugh up your sleeve.
"Ay have not climbed for most ten year."
Mack said, "That's not hard to believe."

Into the pole he chopped his spurs,
With a terrible might and main,
And out of the pole he jerked and squirmed,
Then into the pole again.

Inch by inch he mounted on,
With many a grunt and groan;
And every little way or so
He'd stop to cough and moan.

At last—through dire fatigue—he gained
The cross arm with the leads.
His body shook, and on his brow
The sweat stood out in beads.

Then like the man who, in the sea,
Grabs for the floating spar,
He grabs the arm—looks down the pole
Upon the ground so far.

With style his own and num'rous grunts,
His safety then he strapped;
His pliers from his belt he took
And both the wires he snapped.

In course of time he reached the ground;
He sighed and mopped his dome.
The way he looked, I thought that he
Felt much like going home.

Two days of toil—the strain soon told.
He thought he'd rather quit,
And go down south where wages
Were above ours just a bit.

This trouble job was new to him;
Construction he knew well,
He'd served his two years as a 'grunt'—
At least to hear him tell.

Construction gangs—we thought a bit—
Sometimes they have to eat.
A cook would remedy quite well
With corn and beans and meat.

And, also, with the gang he might
Have watched them make a splice
And tie up dead-ends, when he was
Not cooking chow or rice.

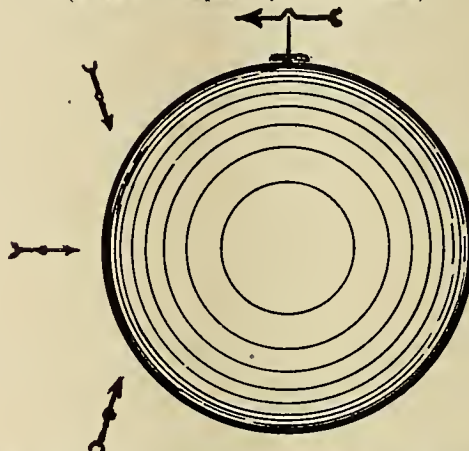
With a shuffling gait he stumbled out.
He's a boomer—a cook by trade;
But he does some linework on the side.
He surely bane a Swade.

EMERSON EASTERLING.

Imagine the disgust of the English Tommy who expected to be employed in the laying of gas and water mains, but who found himself assigned to a camp kitchen. "I'm a mainsman," he said, according to the London Electrical Review, "and when I did a trade test I was told to solder a joint. I did it all right, and my papers were marked 'joint well done.' And, blimey, the next think I knew I was ordered to France as a first-class cook."

ENGINEERS OF YESTERDAY—5. GILBERT

(A Series Compiled by A. L. Jordan)



Why is Gilbert called the "Father of Magnetism"? William Gilbert, who was physician to Queen Elizabeth of England, in 1600 published his great book on magnetism. In it he makes clear the fact of the earth's magnetism, as distinct from gravitation, and illustrates it by the "terrella," a small sphere of lodestone, as shown in the diagram. He notes the difference between magnetic and electric forces (he was the first to use the words "electric attraction"), the fact that iron can be magnetized by hammering it when in a north and south position, etc.

SAN FRANCISCO
PUBLIC LIBRARY

JOURNAL OF ELECTRICITY

VOL. 42 NO. 7

SAN FRANCISCO, APRIL 1, 1919

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Turn to the middle of your
Saturday Evening Post,
May 3rd,

and you will find a mighty striking
Hotpoint announcement.

Then put the Post in your win-
dow. What more compelling
window ad could you have?

This picture

is a little section out of the May
3rd Saturday Evening Post ad.

We are trying to educate the
women of the country to buy
percolators that are protected
by this automatic switch which
anyone can reset in a jiffy.

*Have your sales force
demonstrate this switch
whenever they show
Hotpoint Percolators*

The profit you make from
the merchandising of house-
hold appliances depends pri-
marily on your turnover.

How many times did you
turn your hollow-ware
stock last year?

Whatever the answer, you
can increase your turnover
this year with

Hotpoint Tableware

For instance: Look at that line of percolators — every one equipped with the famous Hotpoint percolating device — no valves, floats or traps; every one equipped with the famous Hotpoint safety switch — if it over-heats, simply reset it.

No. 20611

This is our 6-cup aluminum percolator
with solid cast aluminum spout. \$10.00.
Same design in nickel, \$11.50

No. 20652

9-cup Grecian Urn with paneled sides. \$21.50
Same design unpaneled, \$18.50

No. 20620

5-cup nickeled percolating pot. \$11.50.
Same pattern 6-cup paneled sides,
\$13.50

With this line of hollow-ware you can take care of all the June weddings and other anniversary and gift occasions

Edison Electric Appliance Company, Inc.

CHICAGO

New York

Ontario, Calif.

Atlanta

Manufacturers of these four well known lines of household electrical appliances

HOTPOINT

GENERAL ELECTRIC

EDISON

HUGHES



THE old oaken bucket still clings to the well,
but with the windmill it goes out of date
as soon as the county can afford a regular
system of water supply.

A dam and a reservoir are the economic answer
to the water that goes over the fall.

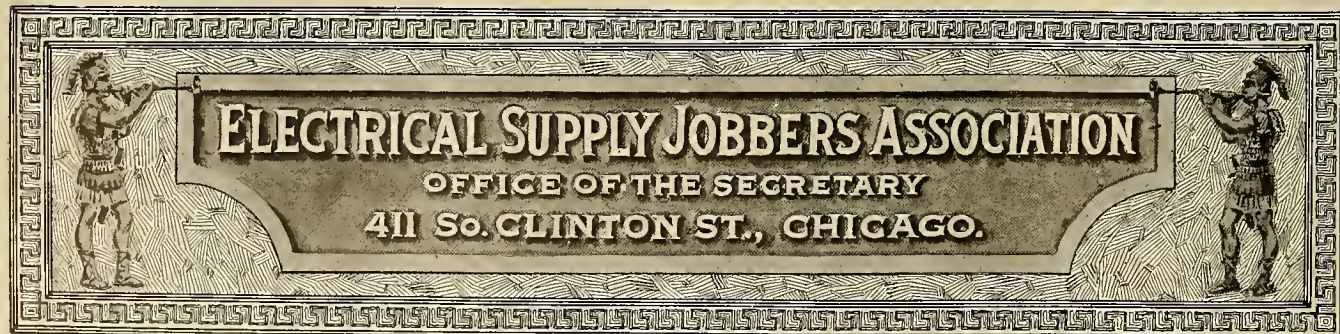
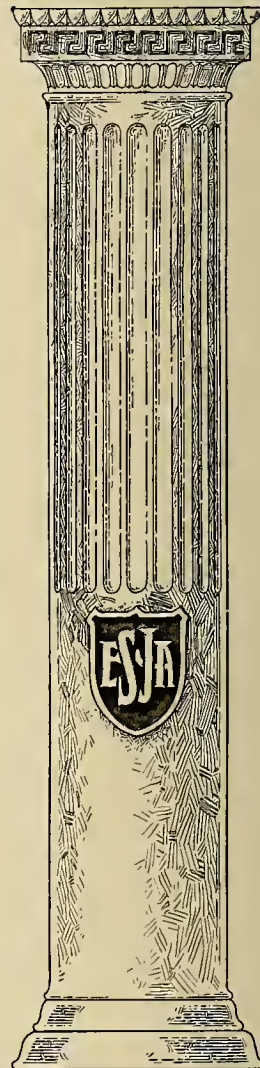
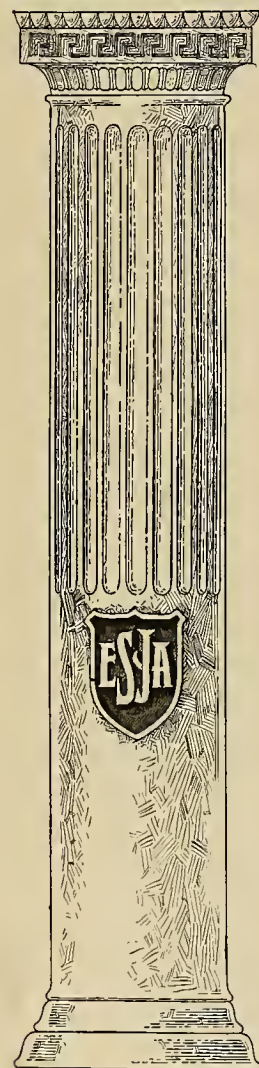
When you wish to talk at long distance you wouldn't think
of building your own individual telephone line.

In the electrical industry it's one man's business to make the
goods, and another's to distribute them.

This system has resulted from the nature of the business.

The manufacturer can serve his customers best by utilizing
the perfected system of distribution that obtains with Jobber
representation.

The buyer gains, because this service has been built up in
his interest and its evolution is based upon his requirements.



JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, APRIL 1, 1919

NUMBER 7

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ROBERT SIBLEY
SECRETARY-TREASURER

ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER



The New Method Electrical in the West —

country is now a creditor instead of a debtor nation. During the past year the United States did an import business of three billion dollars. The month of January 1919, showed the largest exports of any single month in American history. This method electrical is beginning to play a vital part in dispatching and handling the vast traffic involved in Pacific Coast sea ports. Here is an electrical tractor with twelve trailers that instanced how express traffic is handled through the great Ferry Building at the foot of Market Street in San Francisco, through which building it is estimated that more people pass daily than any other single building in the world, with the possible exception of the Union Depot in Paris. The ports of Los Angeles, Portland, Seattle, Tacoma and Vancouver, B. C., are taking their share of this prosperity as well.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, APRIL 1, 1919

Number 7

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YOU ARE NOT IN THE HABIT OF DENYING YOUR BILLS MERELY BECAUSE THE GOODS ARE IN YOUR POSSESSION. YOU HAVEN'T BEEN IN THE HABIT OF QUITTING THE JOB THE MINUTE YOUR EMPLOYER'S EYE WAS REMOVED. YOU DO NOT ASK FOR CHARITY. WELL, THEN—HOW ABOUT THE FIFTH LIBERTY LOAN?



Crystallization of sentiment looking toward the licensing of engineers has taken place to a large degree throughout the West during recent weeks. Several legislatures have enactments under consideration and in some instances these have already passed the legislative bodies and received the signature of the respective governors.

Considered in its broadest aspects the movement toward the legalized certificate plan for the engineer seems to be inevitable and irresistible, because it is fast being recognized that the profession as a whole will be raised in dignity and influence under such legalization, and at the same time a certain sense of security or guarantee of service will be assured to the public at large. In several of the eastern commonwealths legislation has been made necessary due to the issue being forced from outside the profession. It is to be hoped that engineers of the West will anticipate such a contingency as this and arrive at such decisions that concerted and unified action may be possible. It is admitted that the entire subject of some broad certificate plan is, above all, the duty of the national joint engineering council to investigate and advise for concerted national action in so far as may be possible. But this in itself need not interfere with local action being taken at this period that may serve as a foundation for future growth and enlargement.

Although it seems advisable not to wait too long for action in the matter to be forced from without, nevertheless the unity of the engineering body seems more important even than prompt legislation, and the decision of the California engineers to defer action on their proposed bill until the next legislature when it may receive the unanimous support of the profession is to be commended.

In any case it may of course develop that initial measures which it may be possible to enact in the near future will prove inadequate, but the move is in the right direction. Time is now ripe for thoughtful consideration and unquestionably this whole matter will be one of the most urgent and engrossing to

engage the attention of the profession as a whole during the next five year period.

In the last issue of the Journal of Electricity editorial comment was made upon the Master Electrician Bill, or what is commonly known as Senate Bill No. 570, recently withdrawn from consideration before the California

The Passing of Senate Bill 570 Legislature. This is a matter of great current interest, since it has been up for proposed legislation in practically every legislature of this vast section of our country. In California its intensified discussion has brought about a great good, namely, all branches of the electrical industry have at last found themselves. They have found that free, open and above-board discussion is after all the one way to arrive at conclusions which go toward public betterment and increased service to the state.

It is to be said to the credit of the Industrial Accident Commission, too, that they frankly met the force of the conclusions brought out in this open forum discussion by withdrawing the proposed bill and proposing to await the conclusions of a representative committee of such composition as is detailed in the discussion of this matter appearing elsewhere in this issue.

No one can follow the broad policies of men of the electrical industry in the West without feeling a sense of inner pride in the fact that this industry is producing ideals and formulating ethical standards in contractor-dealer associations, jobbers and manufacturers' gatherings and central station activities that will primarily result in great good for the community served, at the same time, of course, adding to the material profit of those engaged in the work.

In regard to the matter at hand, namely, the formulating of helpful rules of electrical inspection and the granting of effective authority for supervision and administration of specific rules for public betterment and accident prevention in electrical matters, the Accident Commission will find in this great industry its strongest supporters and best advisers.

The editorial on the one man car as a safety measure for electric railways which appeared in the Journal of Electricity March 1, 1919, has attracted nation-wide attention. It is interesting to note from the many letters of inquiry and commendation that have come in for editorial attention concerning this matter, that the one-man car is rapidly coming more and more into public attention and its use is being widely extended. The instance in Colorado is of particular interest. In this great commonwealth, the Colorado Springs and Interurban Railway Company, of Colorado Springs, has had one-man cars in operation on its side lines only since April 25, 1918. The company now proposes to install them on its two main lines and expects to have them in operation by April 1, 1919. As far back as 1908, when the first one-man cars were introduced upon the railways of the enterprising city of Missoula, Montana, under the direction of S. R. Inch, then manager of this system but now general manager of the Utah Power & Light Company, this system of installation has been growing in importance in the West, because it has thoroughly established a field of safe and economic usefulness in cities ranging up to 50,000 to 75,000 inhabitants.

In the issue of the Journal of Electricity for October 15, 1918, editorial comment was made giving detailed statistics showing that the Pacific and Mountain States, with but 6.7% of the population of the United States, consume fully 25% of the electric energy generated by the other 93% of the population of the United States, or \$9.67 per capita as against \$4.40 per capita for the rest of the country—nearly four times greater intensive use. It was also shown that in face of this present intensive development there is still undeveloped in this district twice the amount of undeveloped water power existent in the entire remainder of the nation.

This statement has created wide interest and has called forth much favorable comment in many leading magazines and periodicals. It is interesting to follow the preliminary returns of the forthcoming quinquennial report of the Bureau of Census at Washington on the central electric light and power stations of the nation. While all of these have as yet not been made public, the reports for the states west of the Rockies are now available and all of the largest electric power consuming commonwealths of the East. In comparing intensified electrical development in the West with even the largest power consuming commonwealths of the nation—New York, Illinois, Massachusetts—even such comparisons as these show how far western enterprise has outdistanced the East in matters electrical. By taking the 1910 census of population as a comparison, for instance, the per capita consumption in the three great commonwealths above noted is 378 kw-hr. per person per year, while the nine Pacific and Mountain States have a per capita consumption of 820 kw-hr. per

person per year. Montana leads in electric power consumption with 2570 kw-hr. per person per year, with Utah second at 1250 and California third with 1150. There are no states east or west, nor indeed in the world at large, that can show such magnificent utilization of the method electrical as these commonwealths of the West. And this is only the beginning. The people who inhabit this region partake of an enthusiasm and a newness of life fully in accord with the spirit of daring and initiative that is even now formulating a vision of the usefulness of the electrical way in the home, upon the farm, and amid industry and transportation, that will within the next decade far outdistance any achievements hitherto in the method electrical and the utilization of vast natural power resources with which this district is blessed.

It is now beginning to be recognized more and more that the true function of salesmanship is to study the needs of the customer and to sell to him an article of merit that will bring to the purchaser the service for which he pays, and at the same time create a service remuneration to the salesman. In other words, any transaction in which money is paid for something in which value received is not on an equal footing does not constitute a sale. Nor does a transaction in which an article of merit is sold, thus rendering a service, constitute a sale, if the one selling the goods does not receive for it a sum of money that will net a profit to him in value commensurate with the service rendered. Salesmanship, then, may be defined as the act embodied in being able to sense the needs for service and then to supply that service at a compensation in proportion to the service rendered.

One great authority has well said that the super-salesman is a man true to the interests of his customer, and whose supreme purpose is to quicken the imagination of his customer and make the customer see the true virtues of the goods the salesman is selling. Such a salesman foresees the needs of his customers and provides against those needs in full faith that the event will justify his foresight. Indeed such a salesman puts his ideals above his profits, in full confidence that profits accrue to fine ideals intelligently executed.

Those of us who follow closely the trend of the hour cannot help but feel that ideals of salesmanship which are being formulated and put into actual practice in the electrical industry and closely allied engineering activities in the West constitute perhaps today the most remarkable advances in world ethics anywhere recorded.

And in the practical application of these ethical standards published in detail on page 400 of the Journal of Electricity, Nov. 1, 1918, as formulated by the California Electrical Cooperative Campaign, is today asserting itself. While on the one hand we find, for instance, Chas. C. Parlin of the Curtis Publishing Company, at a recent California Electrical Cooperative Campaign dinner, driving home the fact

that national advertising can prove vastly more effectual by the salesman cooperating with and tying-in with national effort, on the other hand we hear at the same gathering C. N. Banta, of the Wells Fargo Nevada National Bank forcefully depicting how cooperation in the truest and highest sense of the word aids in raising the standards of credits, collections and finance.

Hence it is that the modern salesman, bearing in mind these new ideals of cooperative effort and equipped with those spiritual qualities—intentness of purpose, concentration of effort, enthusiasm, initiative, and confidence—may well be said to be preparing for service ahead in the West that will overtop the narrow bounds of a single industry, and we shall not be surprised to find the next decade in the West produce men that will become leaders of thought in the evolution of industry and affairs of state in the years immediately ahead.

Will tomorrow's rush orders be delivered by aeroplane? Will that means of transportation shorten the time of the necessary business trip and revolutionize the methods of spectacular advertising? That the aeroplane is to

become a permanent factor of our life, no one who is familiar with the progress of the art during the war can question. Aside from the enormous strides taken in the perfection of the machine itself, the mere fact that thousands of young men are today proficient in handling aeroplanes would tend to hasten their adoption into many fields of business enterprise.

It is interesting to note that an aeroplane has been adopted by the western division of the Canadian forest service as the most efficient method of locating and reporting forest fires. A large sheep rancher in the north is making use of an aeroplane to locate lost bands of sheep who have strayed off into the mountains. A recent notice tells of the transportation of a washing machine by an aeroplane near Chicago which received wide publicity—an example of its advertising use. During the war a rush order for electrical supplies for the government which could not be delivered by an eastern factory in the required time was called for by an aeroplane from the nearby training school and satisfactorily delivered. The aerial mail service is still more of a curiosity than a business asset, but improvements are coming very fast.

These are but hints of the possible future applications. A committee, of which Viscount Northcliffe was chairman, appointed by the British Government to investigate the extent to which it would be possible to utilize in civil life the trained personnel and aircraft of the military air services, recently reported that the carriage in aircraft of mails, passengers and goods will present no difficulty from the technical point of view. They further pointed out the following special fields where the aeroplane was adaptable:

1. In the case of mails, by competing with telegraph services or in establishing a new type of express letter service.

2. In the case of passengers, by competing with rail, marine, and road services over long distances, or where the journey either includes sea as well as land passages, or is between places not conveniently served by rail.

3. In the case of goods, by enabling ordinary merchandise, commercial samples, and even (if necessary) spare parts of machinery urgently required, to be conveyed quickly to places otherwise inaccessible except by journeys involving great expenditure of time.

The popular belief in the high mortality of those who trust themselves to the air will have to be overcome before any passenger service can be practically established, but this is only a matter of time. With the hazards of war and of the trick flying necessary to dodge bullets and outwit the enemy removed, the safety factor is greatly raised. Although, of course, the possible improvements are unlimited, the machine today presents all necessary factors for practical use. The frame of the aeroplane is much stronger than popularly believed and sufficient to stand ordinary strains for long periods, a stabilizer has been invented which permits the machine to maintain its equilibrium even in case of accident to the pilot, and the art of flying is so much better understood that in most cases it is possible to land safely even in the case of failure of the engine. The greatest problem as yet unsolved is that of landing—a possible solution for which is suggested in the timely article by C. B. Merrick which appears elsewhere in this issue.

But if the general use of air transportation for passengers and freight is yet to be developed, the aeroplane for advertising stunts and feature purposes is here today. Not only does electricity play an important part in the training of aviators, in the radio telephone and other instruments which broaden the field of application, and in the night marking of landing places and danger signals, but this progressive industry will undoubtedly be one of the first to make practical use of the new field.

THE NEW JOURNAL SERVICE: The great convention issue of the Journal of Electricity will appear April 15, 1919. This issue has received such cordial support from all quarters that both from an advertising and a reading viewpoint all previous efforts of the Journal of Electricity will be eclipsed. The convention papers, covering the matters to be discussed at the Coronado Convention, April 30-May 2, 1919, are of exceptionally high order and will prove to be of great timely value. The advertisers who have so liberally supported this effort of the Journal of Electricity will display new ideas in electrical design and installation well worthy of the most thoughtful consideration and hearty support of all our readers.

With this issue of the Journal of Electricity are inaugurated the Library series by Miss Krause, librarian of H. M. Byllesby & Company, and the educational series on practical lessons in electricity, under the direction of the Extension Division of the University of California and the University of Oregon. Both these series have already attracted nationwide attention and it is believed this interest will be later found fully warranted.

All copies of the various issues of the Journal of Electricity since the first of the year have been completely exhausted and as there is a great call for extra copies, face value will be paid for receipt of any and all copies of this period sent into the office of the Journal of Electricity.

PORT FACILITIES AND FREIGHT HANDLING

(Plans for improving San Francisco harbor to meet the expanding commerce of peace times include an increase in efficiency through the adoption of mechanical freight handling facilities. The argument for these conveniences and the rough outline of a possible plan of procedure are given in the following extracts from a report prepared for the San Francisco Chamber of Commerce by Miles Standish, now with the State Harbor Commission, and F. E. Boyd, manager of the small motor department of the General Electric Company, San Francisco. —The Editor.)

The Public—The docks, railway, spur tracks, and drayage areas constitute essentials of the port of San Francisco. But mechanical equipment for handling freight is as much of an essential to a modern port as the harness is to the proper utilization of a horse and wagon.

The time has passed when a pier can be considered as a separate unit. It is a part of the terminal installation, and in order to get the greatest returns out of the money invested, the pier must be equipped with mechanical freight handling appliances, which mean:

Increased capacity of terminal due to increased speed in handling freight.

Decreased overhead charges per ton due to increased tonnage handled at a relatively small increase in investment.

Greater pier capacity per unit of floor area brought about by the fact that with machinery it is practical to tier 15 to 25 feet, as against 5 feet by hand. This alone triples a pier's capacity.

The Steamship Companies—It is not uncommon to find 50 to 75 drays and automobile trucks lined

The employment of this machinery means to the consumer a reduction in the cost of living, as is illustrated by the following facts:

Recent investigations made by the Interstate Commerce Commission into the subject of water borne freight show that the cost of carriage of freight on the water is 40% of the total, whereas the cost of handling the freight at the terminals is 60% of the total. This is particularly true of coast-wise shipping. When boats can make more trips per year to San Francisco the rates to this port will be better and again the consumer will benefit, to say nothing of all the benefits directly or indirectly resulting from the ideas which have preceded.



LOADING LARGE CRATES ON MOTOR TRUCKS

Expedition in loading trucks means money saved for the transfer and for the steamship company and hence, ultimately, for the consumer.

up on and outside of a pier waiting to dispose of or receive a load. This represents idle investment and unnecessary overhead charges. It also means congestion in drayage areas and at the entrances and exits of the docks, all of which is expensive.

The Merchant and the Consumer—The employment of mechanical freight handling machinery means to the merchant quicker deliveries and uniformly regular deliveries, all of which means greater "turn-overs" and increased earning power of his capital.



A MECHANICAL CONVEYOR AND PILER

The bags of sugar in this factory at Oxnard, California, are carried to position and stacked with one continuous process. These conveyors are especially useful in transferring bulky material to and from the holds of ships.

Labor—The employment of mechanical freight handling appliances will increase capacity for business and the activities of the community will be in proportion. Labor as a whole will be better. Witness the automobile industry which has reached its present enormous size primarily as a result of the so-called labor saving machinery employed. Labor only need look at the greatly increased demand for workers in this industry to appreciate the real advantages to it of the employment of mechanical appliances and automatic machinery.

Competition—The cost of transportation from the place of origin to the place of consumption gen-

erally limits the area within which business can be done. A decrease in transportation expense not only facilitates commerce, but creates commerce and manufacture.

Transportation efficiency is being recognized as principally a terminal problem. No transportation can be more efficient than the terminal facilities permit it to be.

The following tables have been developed by the Electric Vehicle Association of America, based on figures given by Mr. W. J. Wilgus, late vice-president of the New York Central Railroad.

As a concrete example, we will suppose that a manufacturer in Philadelphia sends one ton of freight to a merchant in New York City. From the time the freight leaves the manufacturer the Philadelphia charges are as follows:

Labor cost of loading on a wagon.....	\$.25
Unloading of freight station.....	.50
Cost to railroad in billing and other clerical work.....	.40
Actual operating expense of loading and switching freight car, etc. ....	.25
	<hr/> \$1.40

The cost of handling in New York is as follows:

Terminal costs on New Jersey side of North River (average of all railroads)	\$.15
Lighterage .....	.80
Terminal cost on water front of Manhattan Island.....	.50
Cartage expenses in New York City.....	.80
	<hr/> \$2.25

The terminal charges at both ends equal a total of \$3.65 on one ton of freight. It costs the railway to haul freight 3 mills per ton mile, or for the 90 miles between Philadelphia and New York it costs 27c per ton. The cost of getting a ton of freight started on its journey at one end and handling it from the Jersey City terminal to the consignee's store at the other end is nearly 14 times as much as the cost to haul the goods all the way from Philadelphia to New York. To haul a ton of freight 1000 miles from New York to Chicago costs \$3.00, or 60c less than the terminal charges at both ends. In other words, it costs more to load a barrel into a car at Chicago and to unload it at New York than it does to move the same barrel between the two cities on the railroad.



STACKING BALED PAPER BY MACHINERY

It is more economical to tier 20 to 25 feet with mechanical devices than 5 ft. by hand. This is but one method of doubling the value of wharf space by utilizing it more intensively.

Methods of Improvement

A Comprehensive Plan.—Although this report deals entirely with the problem of handling freight, it is important to recognize that in working out this problem due consideration must be given to other essentials of our water front. The plan of a port should not only include an arrangement of docks, belt line railway, spur tracks, drayage areas, and a system for handling freight, but should also give consideration to the proper location of freight yards, warehouses, and to the encouragement of the establishment of factories and factory lofts in the section of the community conducive to efficient movement of raw and finished material.

A Special Plan.—A special plan providing for a general scheme of handling freight should be worked out with the idea in view of keeping the freight on wheels and preventing congestion. This scheme should develop a logical method of transferring freight from and between barges, river boats, ocean going vessels, cars, docks, drays, warehouses and factories.

Working Present Equipment.—Our present scheme of developing the water front seems to be tending towards building more docks. This results in an expansion of the area over which the freight is handled. Development in this direction is in accordance with good practice up to a certain point, beyond which it is better to provide improvements for being able to handle increased volume of business in a restricted area. The price of a new pier or two would pay for an immense amount of freight handling machinery, which instead of increasing our facilities by the capacity of one or two new piers, would increase the capacity of all our present piers two or three times.

Every calculating engineer and business man will quickly appreciate the value of planning in this direction, as long as we do not carry the development beyond a point where undue congestion might be encountered.

Standardizing Methods.—In so far as possible, the scheme of handling freight should be worked out with a view of providing a similarity of methods on as many docks as is possible.

A definite plan and place for receiving and shipping goods should be provided. This is particularly applicable to goods which are drayed. Platforms on the shore end of piers are good and eliminate a great deal of confusion and congestion on the docks. With these platforms properly connected, by mechanical freight handling appliances, with the tiering spaces on the docks, the drays can be kept off the dock almost entirely.

The docks should be wired for electricity so as to supply not only current for lighting, but similar current for power purposes, in order that power-driven appliances may be used at all points on any dock or can be transferred from one dock to another, as occasion may demand.

With the employment of large numbers of terminal freight handling battery trucks, it might not be amiss to provide at suitable points battery charging stations for the trucks.

Similarity in methods on all docks would also have the advantage of causing the stevedores to be more efficient, as they will perform their work with less confusion and the draymen will carry out their functions with greater dispatch.

Modernizing the Superstructure.—The character of construction of the sheds is particularly important, as it has a great deal of effect upon the capacity of the port. The ceilings or overhead rafters should be sufficiently strong and high above the floor to permit the use of overhead machinery. The supporting columns must be so proportioned as to withstand the strains resulting from the employ-

speed up the loading and the unloading of boats. The city has provided four electric terminal freight handling storage battery trucks and equipment at one end of the docks for charging the batteries. At the present moment Portland is receiving bids on a very large grain elevator, this including some 1500 electrical horsepower, to facilitate the rapid and efficient handling of the cargo.

At Seattle, the port commission has provided the Smith Cove Terminal with a gantry crane, a shear-leg hoist, terminal freight handling storage battery trucks and tractors, and motor driven conveyors. The privately owned docks at Seattle are equipped with terminal freight handling storage battery trucks.

New Orleans has given its problems serious consideration and has equipped its water front with motor driven conveyors and other machinery. It is interesting to note that New Orleans has found it advisable and profitable to install mechanical freight handling equipment in the face of the fact that they have so-called cheap negro labor.

Likewise in Germany, the Port of Hamburg long before the war was notably well equipped with powerful cranes and mechanical appliances generally, although they, like New Orleans, had at hand labor much cheaper than that available at our Pacific Coast ports.

Boston was provided by the commonwealth of Massachusetts, under the supervision of the Directors of the Port of Boston, with a four-million dollar pier called the Commonwealth Pier, which is equipped with a great system of cargo hoists and other machinery. Although it is reported that this great dock has not proved all its designers expected, it has emphasized to the authorities at Boston the importance and the bigness of the problem confronting them and they are now studying their situation with a view of providing more capable means to take care of the business which centers in their community.

New York for a number of years has been more or less continuously studying and developing its water front in connection with the freight handling problem.

Saving by Machinery

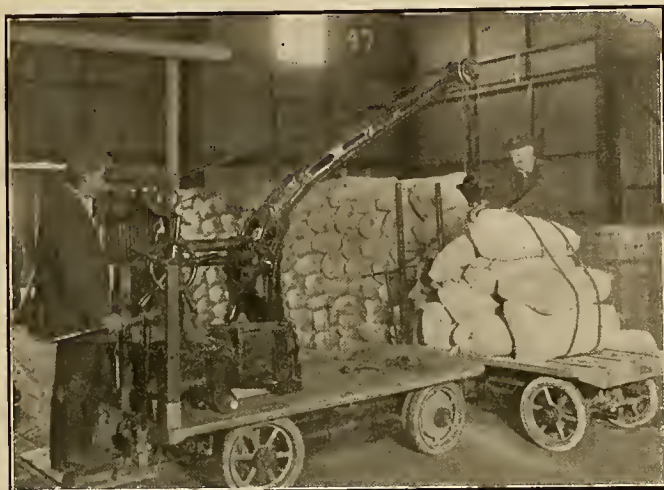
The savings brought about by the employment of many of the appliances is largely apparent, but the following points should be emphasized, as they are not so readily appreciated:

By use of overhead appliances valuable floor space is made available for sorting and tiering.

When an overhead adjustable loop system is used, great flexibility is attainable and high tiering is made easy, thereby doubling or tripling the capacity of a given pier.

An argument in favor of dock cranes is that power from the engine room is not always required, and in many cases the fire may be drawn, effecting a saving therefore to the ship owner and producing an added attraction to the port.

It is also possible with electrically operated dock cranes to use a portable controller, making it possible for the operator to see the load being handled from the bottom of the hold until it is laid on the pier. This method of control is also conducive of less damaged goods and breakage.



AN ELECTRIC LOADER

The prompt clearing of the dock space is what makes it possible to increase the service of the pier and expedite shipping. Nothing is more important in lessening this time factor than mechanical devices for handling freight.

ment of overhead appliances, and also strong enough to permit the employment of gantry cranes along the dock edge.

At docks where passengers are liable to be received, it is advisable to provide overhead gangways.

Modern practice in shed construction is in the direction of two-story buildings. This arrangement is susceptible of a more satisfactory scheme of receiving and shipping freight. Goods being unloaded from the boats can be deposited upon the second floor and discharged into trucks and cars, located on the first floor, by means of chutes and other efficient freight handling appliances. It is also possible to so design the second story of the shed that it can project over the street entrance to the pier, thereby permitting of the loading of drays without their having to go onto the pier.

Night Deliveries.—It is interesting to note that in the East the suggestion has been advanced that night deliveries by drays could be employed to eliminate congestion at our big ports; the idea being connected up with the fact that our railways run day and night and their capacity would be very much limited if they ran only during the day, to say nothing of the great congestion which would take place at their terminals.

What Others Are Doing

The City of Portland has equipped its municipal dock with portable electric winches to help and to

In connection with the many forms of power-driven conveyors for tiering purposes, it should be pointed out that it is more economical to tier 20 to 25 feet with these devices than it is to tier by hand 5 feet. Furthermore, it is not to be overlooked that it is cheaper to hand truck 400 feet on the dock than to tier by hand 5 ft.

Although there are so many obvious advantages and savings in using electrically driven machinery and trucks, there are but a very limited number of reasons for using the old two-wheeled hand trucks



THE STORAGE BATTERY TRUCK

The electric truck is the one mechanical freight handling convenience which may be said to be in general use. Its advantages are so obvious that the burden of proof now rests with the users of hand trucks.

when we consider the great advantages of the hand operated transveyors.

When all is said and done, the present hand methods employed in handling freight are so indefensible, considering modern appliances at hand and the relatively small investment associated with them, it is remarkable that we have continued with the antiquated hand methods so long. There really should be no necessity of arguing for the employment of mechanical freight handling appliances. The proof should be the reverse, as it were, and one should be asked to prove why they should continue to employ the present hand methods.

FUSE SIZES FOR INDUSTRIAL MOTORS

The proper size of fuse for a motor is only too often obtained by the chief electrician or one of his repairmen by haphazard methods. The motor's normal operating current is given by the maker on the name-plate, but fuses are properly selected of a larger capacity for starting and for momentary overloads. Hence it is rather more usual for the maintenance man to select his fuses "be guess and be gosh," with a view to their permanence in service rather than the safety of the motor they are supposed to protect.

Since the fuses for squirrel-cage and repulsion motors without rheostats are, respectively, rated at 3 and 4 times full-load current, they give practically no overload protection. Hence it is recommended that double-throw switches be installed connecting the motor through fuses of 1.5 times full-load rating (as underwound rotor sizes) for running and through the regular heavier fuses or direct to the line for starting.

In order to give a practical working idea of what sizes to use, the Westinghouse Electric & Manufacturing Company has prepared the accompanying tables. These are based on the following assumptions as to size of fuse required to stand starting current without blowing:

Type	Times Fuse Load Current at Starting
Polyphase Wound Rotor.....	1 1/4
Squirrel Cage (thrown on line).....	3
Single-Phase Repulsion Induction— With Rheostat	2
Single-Phase Repulsion Induction— Without Rheostat	4
Direct Current	1 1/4

DIRECT CURRENT MOTORS			
H.P.	115	230	550
1	10	5	3
1 1/2	15	8	3
2	20	10	5
2 1/2	25	12	6
3	30	15	6
3 1/2	35	15	6
5	50	25	10
6 1/2	65	35	15
7 1/2	70	35	15
8 1/2	85	45	20
10	90	45	20
11	100	55	25
12 1/2	110	60	25
15	125	70	30
20	175	90	35
25	225	110	45
30	275	125	55
35	325	150	65
40	350	175	75
50	450	225	95
60	550		110
75			150
100			200

3-PHASE WOUND ROTOR INDUCTION MOTORS				
H. P.	Fuse Rating (Amp.)	When Voltage Is	550	
	220	440		
5	20	10	8	
7 1/2	30	15	12	
10	40	20	15	
15	50	25	20	
20	70	35	30	
25	85	40	35	
30	100	50	40	
35	125	60	50	
40	150	70	60	
50	175	80	65	

2-PHASE WOUND ROTOR INDUCTION MOTORS				
H. P.	Fuse Rating (Amp.)	When Voltage Is		
	220	440		
5	20	8		
7 1/2	26	15		
10	36	20		
15	45	25		
20	60	30		
25	70	35		
30	90	45		
35	110	55		
40	120	60		
50	150	70		

3-PHASE SQUIRREL CAGE MOTORS				
H. P.	Fuse Rating (Amp.)	When Voltage Is		550
	110	220	440	
1/2	12	6	3	2
1	20	10	5	4
2	35	20	10	8
3	60	30	15	12
5	90	45	25	20

2-PHASE SQUIRREL CAGE MOTORS				
H. P.	Fuse Rating (Amp.)	When Voltage Is		
	110	220	440	
1/2	10	6	3	
1	20	10	5	
2	35	15	10	
3	45	25	15	
5	80	40	20	

TYPE AR SINGLE PHASE MOTORS				
H.P.	Without Rheostat		With Rheostat	
	110	220	110	220
2	80	40	40	20
3	120	60	60	30
5	200	100	100	55
7 1/2	325	175	175	80
10	400	200	200	100
1/2	20	10	10	6
3/4	30	15	15	8
1	40	20	20	10

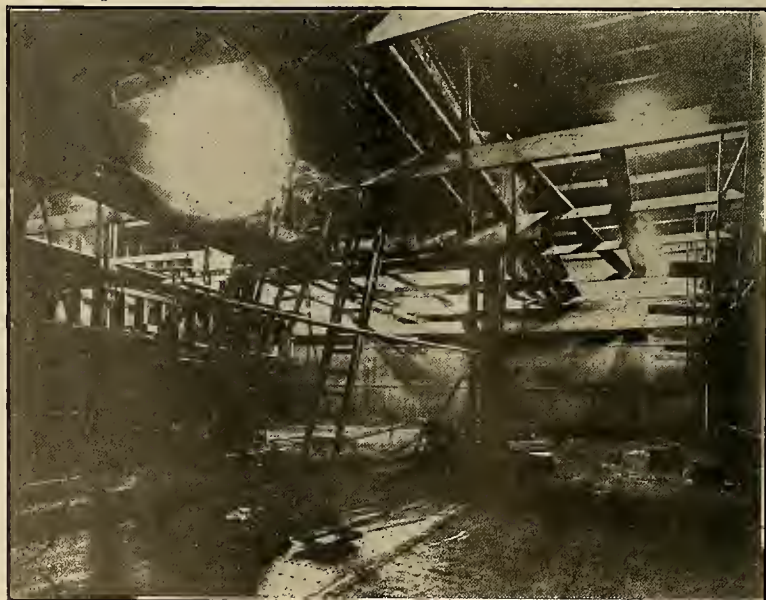
PORTLAND SHIP YARD ILLUMINATION

General night illumination of four hulls. The overhead illumination is furnished by 50-1000 watt units in Benjamin reflectors on goose necks which can be raised and lowered twenty feet. They are wired one circuit per lamp. The midway illumination is produced by 72-500 watt, 540-2X Benjamin reflectors with special deep guards. They are fastened to staging forty feet from the ground and are wired 2 lamps per circuit. The lower level illumination is produced by 259-60 wall lamps. Temporary lights are provided under the hulls — 60-500 watt lamps in 5402 Benjamin reflectors with extra deep guards. There are 14-1000 watt No. 90 X-ray floodlights. The total load amounts to 1600 amperes carried on a 3-wire 110 volt circuit. The cost amounts to \$20,000, exclusive of units.



Night work must be done in the office as well as in the yards and adequate illumination must be furnished. This is the office of the Northwest Steel Company of Portland. The room is 50 by 30 ft. and is illuminated by M. J. Walsh & Company's Perfection Semi-indirect units furnished with 10-300 watt lamps. The ceiling, which is 11 ft. high, is painted white. The walls are of oiled and varnished natural fir.

Better illumination has been one of the main factors in cutting the time of construction from eight months to sixty days for the work on the hull. In both cases two-hour shifts were employed. There used to be a great deal of loafing on the night shift—now quite the opposite. This picture represents hold No. 2 of an 8800 ton steel ship under construction by the Northwest Steel Company of Portland, Ore. The illumination is produced by 7-300 watt lamps.



PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(This is the first of a series of fifteen papers upon the fundamentals of electric circuits and machines. The series forms the backbone of a correspondence course in Electricity which is administered jointly by the University Extension Divisions of the Universities of California and Oregon. Full information in regard to the course will be gladly furnished upon application to the Journal of Electricity or to either of the universities mentioned. Professor Bliss, who has charge of the technical extension instruction for the University of California, is the author both of the Journal discussions and of the correspondence course.—The Editor.)

OHM'S LAW AND THE ELECTRIC CIRCUIT

Our discussion of the electrical principles and practice begins with the consideration of Ohm's Law, which is the basis of all quantitative knowledge of circuits and machines. Its fundamental character is recognized in the industry, and the National Electric Light Association has adopted for its official emblem the Ohm's Law formula " $C = E/R$," which appears upon all the stationery and official documents of this nation-wide organization.



Electric Currents.—In order to utilize electric energy it is necessary to connect the source of the current, such as a battery or generator, to other apparatus, such as motors, heaters, or lamps. There must be a continuous path for the current from the source to the point of use and back again to the source. As soon as this circuit is broken at any point the current stops.

The materials which can carry electricity are called "conductors." They include all metals, both

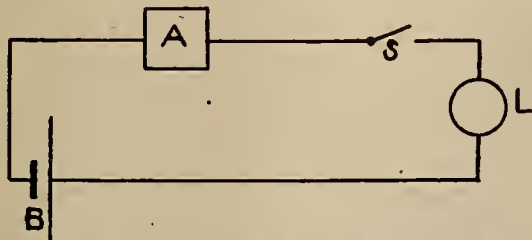


Fig. 1.—The current goes through the ammeter between the battery and the lamp. When the switch (S) is opened the battery (B) can no longer send current to the lamp and the ammeter needle points to the zero mark.

when solid and liquified (as mercury or melted iron); carbon; impure water; earth; moist woods, etc. Materials which stop the flow of electricity more or less completely are termed "insulators." These include glass, porcelain, marble, slate, rubber, paper, cloth, wax, dry wood, etc. The fact that any water, except chemically pure distilled water, can carry electricity causes such materials as wood, cloth, paper, dirt, etc., to fall into one class or the other according to whether they are dry or wet. And small particles or veins of metal in insulating materials sometimes lead the current to places where it is a source of annoyance or danger. Air is generally an insulator, but under certain circumstances it becomes a conductor, as, for example, in the electric arc where large currents flow for a short distance through air.

Measuring Electric Current.—A current of water in a pipe or a river can be metered in various

ways, and the rate of flow can be stated in terms of gallons per second. In a similar way the rate of flow of an electric current can be stated as so many "coulombs per second," but it is more customary to substitute for this phrase the single word "amperes." A statement that "the current is 16 amperes" means that 16 coulombs pass a given point in the wire every second.

Here is a typical example of the use of insulators and conductors in long distance transmission of electric power. The famous crossing of the lines of the Pacific Gas & Electric Company, at Carquinez Straits in California, was for years the most daring enterprise of its kind and today it ranks as the second longest span in the world. Each of the six cables consists of 19 strands of steel wire, making a composite size for each cable of $\frac{7}{8}$ -inch diameter, with the remarkable length of 6200 ft. Assuming that a cable 6200 ft. long, equivalent to No. 1 copper wire, has a resistance of 0.77 ohms and a carrying capacity of 150 amperes, what is the voltage required to force the current through this resistance, according to Oohm's Law?



Tungsten lamps take currents ranging from .23 to .91 amperes in the sizes commonly used (25 to 100 watts); arc lamps take from 3 to 20 amperes; a 10 horsepower motor on a 250 volt circuit will take about 40 amperes.

To measure the rate of flow in an electric circuit we use an instrument called an "ampere meter" or "ammeter." It is inserted into the circuit, as shown in Fig. 1, so that the current must go through the instrument between the source and the load. A needle shaped pointer moving over a scale gives a reading of the current in amperes.

Resistance.—If in the circuit of Fig. 1 we replace the lamp by one of different candle power or by a piece of fine iron wire or by an electric bell, we shall find the ammeter giving an entirely different reading. The battery tries equally hard to force electricity through the circuit, but the amount it can send depends upon the apparatus through which the current must flow. We may say that the lamps

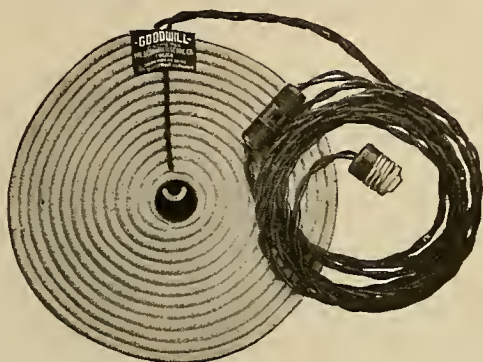
differ in the amount of "resistance" they offer to the passage of electricity. If one takes three times as many amperes as a second, we may say that it has one-third the resistance of the second.

To find what voltage is sending (or available to send) current through a circuit or piece of apparatus, we connect one terminal of the voltmeter to each end of the circuit or to each terminal of the appa-



Fig. 2.—Voltmeter V_1 measures the electromotive force of the generator; V_2 measures the pressure applied to the motor.

Electrical resistance is measured in "ohms." It is thought of as a sort of "electrical friction," like the opposition a rough pipe offers to the flow of water through it. The resistance of a 25 watt Tungsten lamp is about 485 ohms; that of an electric



Here is an electric warming pad—quite a companion on cold nights. Attached to a 110 volt circuit it takes a current of one-half an ampere. What is its resistance?

iron, about 25 ohms; the resistance of a piece of copper wire 1/10 inch in diameter and 1000 feet long is one ohm.

Pressure.—We come now to the consideration of a third factor in electric circuits, namely, the "pressure" which forces the current through the wires. There is evidently something in a battery or an electric generator which forces electricity to go out at one terminal and to come back at the other, just as a pump sends water out at one place and draws it in at another. Of course, an open switch or a closed valve may block the flow, but the electric pressure or water pressure is still ready to start the current when opportunity is offered.

Water pressure is measured in pounds per square inch, by means of a pressure gage. The unit of electrical pressure is the "volt." The pressure or "voltage" in ordinary house circuits is about 110 volts; a dry battery has a pressure of about 1.5 volts; the voltage applied to street car motors is usually about 550.

There should be no confusion about the words ampere and volt. The number of amperes indicates the rate of flow, without reference to the pressure driving the current. Then "110 volts" indicates only a tendency to send current with no reference to how much, if any, actually flows. We may have 110 volts and 1, 5, or 500 amperes, or no flow at all, depending upon the resistance in the circuit.

To measure pressure we use a "voltmeter," an instrument which somewhat resembles an ammeter.

A current of gas may be measured in cubic feet per minute, by means of this meter and a watch; an electric current is more easily measured, in "coulombs per second" or "amperes," by means of a single instrument, the ammeter. The current in either case must go through the meter. (See Fig. 1.)



ratus. In Fig. 2 the voltmeter marked " V_2 " measures the "voltage across the motor" (the pressure tending to send current through the motor), while the other voltmeter measures the pressure the generator exerts to send current through the whole circuit. The two instruments need not give equal readings.

Ohm's Law.—One volt is the pressure needed to send one ampere through one ohm resistance. From this it follows that the number of volts required to send a current through any resistance is equal to the product of the numbers of amperes and ohms. This statement, which is known as Ohm's Law, may



When this switch is opened it stops the current in a high tension power line by interposing an air resistance of millions of ohms. When closed, the resistance of the switch is practically zero. The current carried may amount to 300 amperes. To prevent the escape of current, under the enormous pressure of 110,000 volts, the switch has to be supported upon these huge insulators. Switches of this type are to be used in connection with the Chicago, Milwaukee & Puget Sound—the first electric transcontinental railway.

be indicated by a brief formula: "Volts = amperes \times ohms." Other ways of writing it are: "Amperes = volts \div ohms" and "Ohms = volts \div amperes." All three formulas should be memorized.

The second of the three formulas may be written: "Current = electromotive force \div resistance." Using initials instead of words, $C = E \div R$. This is the symbolic representation of the law as used in the emblem of the N. E. L. A. shown at the head of the article.

sometimes bring a better crowd to a sale because of the seemingly low prices quoted, but such sales, in the long run, destroy confidence in advertising and do not pay, says a bulletin just issued by the Associated Advertising Clubs of the World.

An example mentioned by the Associated bulletin is that of a Michigan electrical goods dealer who advertised nitrogen lamps.

They were burnt out lamps which had been remade. They were plainly described as remade lamps on the label they bore, yet a customer of the store complained to the vigilance committee of the local advertising club that he had been defrauded. He thought they were new lamps, because there was nothing in the advertisement to the contrary.

The vigilance committee took the case up with the dealer and explained the necessity for describing such merchandise for just what it was. The management gladly refunded the purchase price to the displeased customer, agreeing, the same time, to describe goods more fully in the future.

In many lines, "seconds" are sometimes sold without mentioning their quality in advertisements, and to meet this, Los Angeles, through the instrumentality of the truth-in-advertising department of the advertising club of that city, has passed an ordinance providing a heavy penalty for failure to describe such goods fully in an advertisement. An incomplete description in such a case, the Los Angeles advertising club believes, is unfair both to the customer and to competitors, and is therefore detrimental to the best interests of business.

ATTRACTING ATTENTION is the first step in advertising—and every feature of the electrical dealer's business is in some measure advertising. If the store front is to provide its share in this campaign and take its real place as an advertising asset it should have some definite, distinguishing feature. This may be accomplished by means of fresh paint of a striking (but not garish) color, clean modern windows, exceptionally good window illumination, a

novel sign, or even a better sidewalk than its neighbor's.

Change the window display often and make each display interesting. Make the store a bright spot at night—good illumination is a sales magnet.

In other words, a store, to attract favorable attention, must stand out from its neighbors and say, "Here I am!" to every passer-by. It must offer in outward appearance and inside arrangement something to distinguish it from other similar establishments both in and out of its own surroundings. Just as a colorless person is never a success, either socially or in business, so your store must have its own personality on the basis of which it appeals for friends.

IN REGARD TO THE FOREIGN TRADE which the west coast of this country is picking up again as a peace time measure, a little booklet recently published by a printing firm handling foreign matter is of special interest. You will be advertising in Spanish, perhaps—or in Chinese. Well,—

"As a business man, you will agree that to do a successful business, it is above all necessary that you understand the buyer's needs. To understand the buyer's needs, you must understand the buyer.

"The best way to prove to him that you understand him, is to speak to him in precisely the same language he uses in his business. Bear in mind that this does not only mean the same *tongue* he uses, but the same *idioms*, the same technical or trade terms, the very words he uses in reselling the goods you want to sell him.

"The general impression prevails that any native of a given nationality will do, as a translator of business literature, so long as he is versed in writing. But he won't, unless he is versed in business writing and trade terms. You would not think of having an English machinery catalogue written by a professor of English literature. By the same token, a foreign journalist or professor cannot convey your sales message properly in his language."



LIGHTING EASTER WINDOWS

The feature windows which are a part of the Easter plans of every up-to-date dry goods concern or millinery store should not suffer from inadequate lighting. Now is the time for the contractor-dealer to push the sale of lamps, window wiring, portables, and new daylight mazda effects, not only among the big stores of his community, but among the smaller merchants as well.

Technical Hints

BY GEORGE A. SCHNEIDER

SYSTEM IN HANDLING REPAIRS

There is probably no easier way for the electrical contractor-dealer to thoroughly establish a good reputation among his customers or prospective customers than by paying careful attention to the handling of orders involving repairs to appliances and similar devices used for domestic purposes. Here we have special reference to the dealer who is trying to build up a retail business. At the best many repair jobs are a nuisance and at present factory conditions it is difficult to give the service in handling them that is expected by the customer.

Generally speaking repair parts have been difficult to secure. The deliveries have been long and in some instances the prices at which parts are invoiced seem all out of reason. Then again many manufacturers during the past eighteen months or so have refused to furnish repair parts for some of their older and obsolete classes of appliances and devices. Collectively taken these conditions explain the many difficulties experienced during the war period. The dealers of course understand them. Unfortunately the public in most cases does not. However at this writing there is some relief in sight and the manufacturers are doing their best to supply repair parts promptly. To sum up, while the conditions are not the most favorable to allow good service in handling such orders, particularly when parts must be ordered from the factory, still by strict attention to the little details that are so often overlooked the dealer can at least eliminate the delays or misunderstandings for which he alone may be responsible.

First of all, every dealer should have some simple system of keeping a record of the devices brought in for repairs and some method by means of which they can be promptly identified when called for or delivered to the customer. It is important that a detailed record of the various parts or pieces received is kept because in handling there is always likelihood of the parts becoming separated.

Some dealers use a tag for the purpose of identification and record of repairs needed. The tags consist of two parts numbered alike. The main part is attached to the device and the stub given to the customer to serve not only to identify his property but as a sort of a receipt as well. This scheme will work out satisfactorily only when the main portion of the tag contains a complete record of the device and the parts received. The tag should also show the date device is received, customer's name, address and telephone number, date promised and whether or not any price for the job was fixed. The stub end should show the date, a brief description of the device to which it applies and the name of the party receiving the goods and issuing the tags. These are indeed but simple details. Still it is surprising how much trouble can be eliminated by systematically applying them.

The advisability of following out some such system as just outlined was brought out forcefully during the past few months in connection with the sales of a bankrupt electrical concern. Much trouble was experienced in disposing of the devices left for repairs because the only method of identification was a tag simply bearing a number and consequently the trustee was unable to locate the owners. Many of those who did ultimately call did not have the stub of the tag and could not even identify their own property. Had the names and such other notations as just outlined been made on the tag the entire settlement would have been easy.

Later after this experience the writer took every opportunity to observe just how the various dealers handled this matter. Many were found to be following out this identical scheme. Of course we don't expect cases of bankruptcy every day, but some sort of system is just as necessary for a going concern as in clearing out a bankrupt one. In fact, with the proper system and management there would be little likelihood of a concern becoming bankrupt.

When it becomes necessary for the dealer to send devices to the factory for repairs, the handling of the entire matter will be greatly simplified if the dealer will take caution to give full details as to just what repairs are required. Unless this is carefully done in the first letter or on the order there is always a possibility of misunderstanding or delays for want of more complete details. To assist in handling such orders with the least possible question one of the manufacturers of heating devices has standardized certain words and expressions to cover the various kinds of repairs or other work to be done on his devices that are sent to the factory. While these expressions have to the writer's knowledge only been adopted by this particular concern there is no reason why they cannot be used as a guide in conducting negotiations of this kind with any factory. Accordingly they are given in full in the following paragraphs:

Put in working order: The article is made sound and fit for service. The finish is left as found. Missing parts which are not permanently part of the piece returned are not supplied. A repair tag is attached to the package containing it.

Complete: The article is put in working order and all parts which are normally furnished with a new piece are supplied. The finish is left as found. A repair tag is attached to the package containing it.

Refinish: The article is put in working order and the appearance is improved as well as circumstances warrant. It is not completed. A repair tag is attached to the package containing it.

Make Salable: The article is put in working order, completed, and finished like new. It is equal to new goods in every respect, is packed like new goods and does not bear a repair label. It is as valuable as new goods.

Duplicate: A similar article is supplied and the sample returned to you if it is of use and is worth the transportation charges. Otherwise it is scrapped.

Replace: If the article is defective we replace it without charge to you. If not defective we re-finish it at your expense unless you instruct us to the contrary. We decide upon the merit of your claims. New goods do not bear a repair tag, refinished articles do.

As already pointed out, certain classes of repairs are without question a nuisance. Still they will always be required, so the dealer should try to handle them to best advantage and not overlook the fact that very often transactions of this kind afford an excellent opportunity to introduce new lines or goods. Here it is well to recall the story of the man who went to the tailor to have a new set of buttons sewed on his coat. He got the buttons all right and left an order for a new suit. That tailor was a real salesman.

OPERATION OF ELECTRIC BELLS ON ALTERNATING ELECTRIC CURRENTS

At a recent conference of electrical supply men there was an interesting discussion of electric bells and their application to alternating-current circuits. Generally speaking, bells are considered extremely simple devices and accordingly are discussed at such meetings only from the merchandising point of view. At this particular meeting, however, it was agreed that the proper application of bells to alternating-current circuits also involved questions of a technical nature and that in this respect bells should be placed in the same category as inter-communicating telephone systems or similar signal systems of the more complicated types. It is the purpose of this article to discuss several of the questions brought out at that time and to point out the limitations of certain types of bells for alternating current service.

For this purpose the subject may be conveniently divided into two parts:

- (a) The application of bells primarily designed for direct-current circuits to alternating-current circuits, in connection with bell-ringing transformers.
- (b) The application of bells especially designed for alternating-current circuits for use with or without transformers.

In this article bells coming under the first of these divisions will be covered. The discussion will be limited to bells of the vibrating type designed for multiple connection. It should be noted, however, that bells for series operation on both direct- and alternating-current circuits are a commercial article and largely used for certain classes of signaling. In a later article to appear in this department there will be a similar discussion on bells designed specially for alternating-current service.

Generally well-designed direct-current vibrating-type bells in sizes up to and including the five-inch size will operate quite satisfactorily from bell-ringing transformers provided the transformer is of sufficient capacity and its voltage suitably adapted to the bell windings. Bells of these sizes are wound ordinarily so that an alternating-current of from 6 to 14 volts, which is common for the secondary of the smaller size transformers, will be satisfactory. Where a number of bells are to be operated from the

transformer and some are likely to be at a somewhat greater distance from the transformer than others, it is well to select transformers having several secondary voltages, such as 6, 8 or 14 volts, which gives a more flexible scheme, permitting the voltage of the circuit to be selected according to the size of the bell and length of the line between bell and transformer. The bells which are near the transformer will thus not be given a higher voltage than necessary and the continual burning of the contacts within the bell, which will result from over voltage, will be eliminated.

Bells for this service, no matter what size, should always be of the adjustable type as it is very difficult to get good service from those types which are not so designed. Further, there is likely to be some trouble in getting just the right adjustment, which must be accomplished by bending the springs or contacts, in the non-adjustable style.

The capacity of transformer required can be estimated by allowing approximately $1\frac{1}{2}$ watts per inch of bell diameter and estimating the number of bells likely to be rung simultaneously. Thus, a 3-inch bell would require about $4\frac{1}{2}$ watts and 10 of this size rung at the same time would require about 45 watts. Specially designed alternating-current bells are much more efficient and require considerable less energy as will be shown in the article on these types of bells.

Direct-current bells of larger than about five inches will not ring on alternating-current circuits of ordinary frequencies, no matter how wound nor what capacity of transformer is provided, because the length and weight of the armature are such that it cannot follow the rapid changes and variations in the magnetic field set up by the windings. The armature will stand practically still and the bell will emit a very pronounced hum.

The reason for this action will be better understood by remembering one of the simple principles of physics; that every pendulum or vibrating reed has a natural period of vibration, and that it can be made to take up this vibration by the action of a succession of impulses of force occurring in the same frequency as that in which the pendulum or reed vibrates. A typical and familiar example of this is found in the act of one person pushing another in a swing. The swing has its natural period of vibration, depending on the length of the ropes, and a gentle push applied at proper intervals by the person on the ground causes the swing to vibrate with considerable amplitude. If the pushes are applied at intervals not corresponding to the natural period of vibration of the swing, many of them tend to retard rather than help its vibration, so that a useless bumping results, producing but little motion.

From this analogy it will be clear that to operate satisfactorily on alternating-current service the length and weight of the bell armature must be proportioned and so constructed that the armature has a period of vibration which corresponds to the number of alternations or frequency of the supply circuit.

ELECTRICITY IN A LARGE DEPARTMENT STORE

(A department store represents in some measure every branch of industry and calls for applications of electricity which run from shoe repairing machines to apparatus for electrical treatment and dish washers. The extensive electrical installation of one of the largest department stores of San Francisco is here briefly indicated as a suggestion of the possibilities along this line.—The Editor.)

The problem of lighting is perhaps the most familiar use of electricity in connection with a department store—but by no means the only one. The Emporium, of San Francisco, one of the largest department stores on the Pacific Coast, has an electrical department of considerable magnitude located in its basement work shops—and uses electricity for many of the operations in the cafe, the carpenter shop, the shoe repairing department, the delivery department and elsewhere about the store.



CAFETERIA FOR EMPLOYEES

Several hundred employees are served here every day—and all dishes washed by an electric dish washer. A large machine of a different type is used in the public dining room in the main store.

Pumps and General Applications

The main installation is housed in the basement where there are located two air compressors for use with the water system below the level of the city sewer system and two pumps which handle all water for the building, all automatically controlled. A fire pump is also provided which feeds the sprinkler curtain on the west side of the building and is operated by an emergency switch. In case of fire at night in the adjacent buildings which are of less perfect fire-proof construction, the switch is thrown by the watchman, otherwise by the engine room attendant who is always present during the period when the building is in use. An automatic interior sprinkler system cares for interior fires which may occur. A vacuum machine is also located here for the general cleaning of the building with outlets located at convenient points throughout the building.

Repair Department

An interesting industrial application of electricity is found in the shoe repair department where a complicated machine sews the shoes, trims the soles, fits the heels and polishes and finishes the work. This makes possible prompt and efficient service with few attendants. The machine extends for some fifteen feet along the length of the enclos-

ure and may be set in rotation as a whole or operated in sections as needed.

Belt Conveyor in Delivery Department

A belt conveyor, electrically operated, connects the wrapping and delivery departments. All orders for home delivery are sent to the wrapping department and there collected in compartments arranged on the order of large pigeon holes which may be reached from either side. It is thus possible to handle incoming goods from one side and extract the materials of an order for wrapping from the other. A long table is conveniently located on the far side of this rack with paper, boxes and string at hand, where the making up of the packages is done. The upper portion of the sales tag is pasted on the outside to give name and address and the package is then placed on the belt conveyor which carries it direct to the delivery department on the ground floor above, where it may be sorted according to its district and transferred direct to the delivery trucks. The conveyor is some two feet in width and conveniently handles packages of all sizes.

A carpenter shop, also located in the back of the basement floor, is responsible for packing boxes, shelving or small repairs needed about the store. A small rotary saw run by electricity is used here.

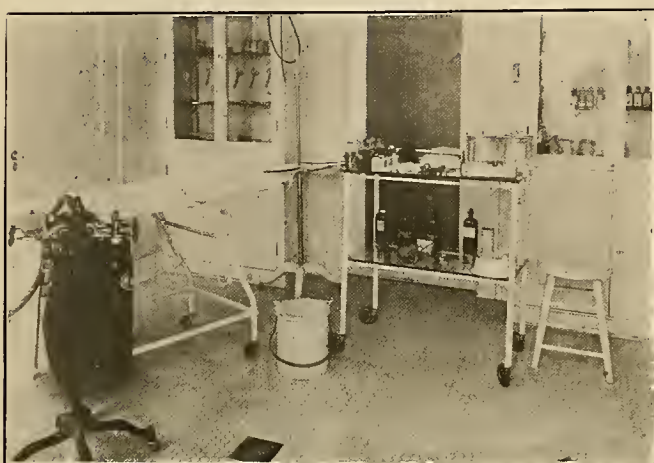
Electricity in the Service Department

The hair dressing department of the main store has several electric appliances, among them a high frequency vibrator, much used to stimulate the scalp or for skin troubles of a nervous origin. A similar equipment is also in use in the medical department of the service building. The service building is a seven story structure adjacent to the Emporium itself in which are located the special rooms for the use of employees. Rest rooms, an auditorium and gymnasium, a cafeteria, class rooms, a pool room, squash court and roof garden and the like are here provided in undoubtedly the most complete service department to be found anywhere in the West. There is a very elaborate medical department here provided with examination rooms, a small operating room for minor operations and a men's and women's ward in which any cases requiring such treatment may be kept over night. Food for such emergencies is to be had from the cafeteria located in the building. The regular hospital lighting system is used in this department with a light over the door showing when the room is in use. The electric vibrator here used has been temporarily transferred to the main store but a new instrument has been ordered and is to form a permanent part of the equipment.

The Dish Washing Machines

A very successful installation is that of the electric dish washing machine in the cafeteria of

this building. Several hundred employes are served here daily and dishes mount up to from 700 to 1000, all of which are handled through the dish washer. It consists of three tanks, the first of which is filled with hot, soapy water, the other two with clear hot water for rinsing into which the dishes are dipped in turn. The water is kept violently in motion by an electric motor and very satisfactorily handles all types of dishes. The things to be washed are piled in baskets on a drain board to the left and thus transferred from one water to the other to a drain board at the right where they are left to drain. At present the baskets are of a simple wire mesh pro-



THE MEDICAL DEPARTMENT

An electric vibrator is installed here to give free treatment to employes for whom it is prescribed

vided with hooks by which they are suspended in the water, but wooden spindles are to be placed in the center for convenience in stacking dishes. They were originally so arranged but in the long years of service through which the dish washer has been in daily use, the spindles were entirely worn away.

The main cafe, open to the public, is also provided with an electric dish washer of a somewhat more elaborate type. In this case the dishes are stacked in large wooden racks about three feet by two in which partitions of various sizes provide space for dishes of all sizes. Everything is included from glassware to silver, a rather unusual refinement in a mechanical dish washer, these two items generally being done by hand. These racks are filled in succession and pushed along a shelf at about waist height up to the first chamber. This is located at the same level and is provided with sliding doors which need only be lifted and the rack slid in. On closing the door, soapy water at a boiling temperature is automatically swirled through the dishes from above and below. The doors are then raised, the rack transferred to a resting board at the other side and from thence into the second chamber, operated in much the same way. Clear boiling water and steam are used in this second case and the racks are then slid over to a drain board beyond and there allowed to set until dry. This takes but an instant as the steam soon evaporates. A further use of electricity in this kitchen is in connection with a mixer used for whipping cream or eggs, stirring bat-

ter, etc. As some forty pies are baked in preparation for a noon's demand, as well as bread baked, cream puffs filled and the like, the mixer is in almost constant use.

Signal Lights

An interesting adaptation of electricity to the special needs of an employes' call service in such a large establishment has been ingeniously worked out. There are certain members of the staff who are often called to different parts of the building where it is difficult to locate them when wanted. In some stores it is customary to use a series of electric bell signals, but this has many features which are objectionable. The Emporium has installed sets of call lights at various points throughout the store. There are six lights of different colors which are operated from the telephone desk. Each official likely to be called for has his combination of lights which may be flashed on all over the store at once. As soon as he sees his light or lights, he communicates at his earliest convenience with the telephone switchboard and learns where he is wanted and for what purpose. Thus a visitor calls to see the Welfare Director who at that moment happens to be talking to the head of a department in the basement. Some one in the office of the Welfare Director communicates this fact with the telephone station who flashes on the lights. The Welfare Director notes her lights appear on the board above the aisle near the department in question and calls up the central office to learn that some one is waiting.

Electricity is, in short, the very good servant of the store, utilized wherever convenience has suggested that its application is possible.

ENGLISH NATIONAL KITCHENS

A description of the equipment of a "national kitchen" installed at the public baths, Wandsworth, is given by the London Electrical Review. The electrical equipment comprises two fish fryers, four boiling plates, and two "F" type roasting and baking ovens, a five-tier electric steamer being on order. The ovens are of substantial cast-iron construction and are lagged on all sides; standard B. and K. elements are fitted at back and sides, the loading being at full heat 7.2 kw. Heat control is effected at a switch panel mounted above the oven; two rotary three-heat switches, double-pole fuses, and pilot lamps are provided.

The four boiling plates are each fitted with a 6-in. open-type ring mounted flush with the surface of a polished cast-iron plate measuring 18 in. by 11 in., each ring being loaded to a maximum of 1.2 kw.

The electrical equipment will have a connected load of 28.2 kw. when the steamer has been installed. The cookers are balanced across the three-wire a.c. system, the pressure between outers and neutral being 205 volts. All baking, roasting, fish frying and boiling will be done electrically, and much of the duty at present carried out by steam will be performed by the B. and K. steamer when it has been delivered.

THE BUSINESS LIBRARY

BY LOUISE B. KRAUSE

(Check up the amount of time wasted by the average business man through lack of having the information he wants at hand. The business library is the service department in your business which saves you that time. If your concern is too small to afford a librarian, it is nevertheless in need of the librarian's method of handling records. This is the first of a series of articles by the well known librarian of H. M. Byllesby & Company. Attention is called to the fact that this material is copyrighted—reprinting is permitted only on special application.—The Editor.)

THE ORGANIZATION OF THE BUSINESS LIBRARY

What is meant by the word library? Twenty-five years ago it could be accurately defined as a collection of books on a series of shelves, and although this old definition still partially describes its present form, the true interpretation of what a business library really is, can be stated best by saying that it is a genuine service department, whose chief busi-

would find useful information, or he discovered references to valuable books, pamphlets or documents in his casual reading of newspapers and periodicals. As a last resort, in cases of emergency he telephoned to various business organizations whom he thought could tell, out of their experience, what he wished to know.



The Southern California Edison Company's files of documents and periodicals are attractively stored in the special library of the new Southern California Edison Building in Los Angeles and made a vital asset by being placed in charge of a trained librarian.

ness is to give information to the members of a firm on subjects of vital importance in the conduct of their business.

The business library is not limited to a collection of books, but contains information in any form, namely, periodicals, pamphlets, trade catalogs, photographs, lantern slides, and also manuscript notes which are accumulated in connection with the specific work of an organization. The business library even goes so far in its service as to supply information which is obtained by "word of mouth" in advance of its appearance on the printed page.

The Evolution of the Business Library

Before the business library came into being as a special department of business organizations, and before public libraries were making a specialty of collecting information on business subjects, the business man picked up his supply of information in haphazard fashion. He either was told by a business acquaintance,—often a salesman of a special line who was doing business with him,—of some trade literature or government documents in which he



An example of a practical library equipment is that of the Commonwealth Edison Company in Chicago. The library is in constant use and is particularly popular over the lunch period. Note the excellent indirect lighting.

Business has, however, grown too large in its multiplicity of interests for the business man to get his information in so desultory and unorganized a fashion, for the business man must be a good forecaster and interpreter of conditions, not by means of guesswork but by the aid of obtainable facts, and he must study and analyze a large number of related subjects. The success of many of our richest industries is due in large measure to this particular element, the wise forecasting of conditions to come, for, as a recent periodical article stated, "business is a procession of problems; big or little, any business must keep moving ahead, finding its way past one pitfall and obstacle after another. In another sense business is a matter of vision; the foresight that looks long ahead to new opportunity and to the ways and means of realizing it, is an essential in the growth and progress that brings success."

Business men have long since recognized that rule of thumb methods have passed away, and that they not only can not learn by experience exclusively, but that the utilization of the knowledge of other men recorded in reliable business data is of the highest value.

Present day competition makes it imperative also that every business man know as much as his competitor does, and he must have therefore not something on a subject but everything of value on a subject, and it must be exact and authoritative

information which he can trust. Business data must also be kept strictly up to date, which under present-day conditions is no easy task, as information is out of date almost before it is off the press.

The business man not only needs to collect accurate, exhaustive, up to date information, but he needs to have it so well organized that he can put his fingers, at a moment's notice, upon the exact information he desires. The systematic organization of information into quick working files means an

give more time to his firm on the problems which his expert knowledge was able to solve.

General Principles of Organization

The essential principles in organizing a successful business library can be briefly stated as follows:

Centralization of material within the business organization.

Coordination of the business library with the facilities of the public and special libraries of the city in which the business library is located.

Centralization of Library Material

The first step in establishing a library in a business organization is the centralization of all the printed material available in its different offices or departments. This is exactly what is not done in a large number of business houses. Books, pamphlets and other valuable information are scattered among the various members of the organization, who treat them as personal property and preserve them in their private desks as carefully as a squirrel hides his store of good nuts. In many business organizations the policy of the employees in regard to information seems to be, to hold on to everything of value for one's personal use, regardless of how much value the information might be to another member of the organization, and also regardless of the fact that the material has been paid for out of the company's funds.

It should be said, however, in defense of the practice of not putting information into a central library, that it is not always based upon thoughtless or selfish habits, but upon lack of confidence; there is a fear that if information passes out of the hands of the man who may wish to use it again some time, in a hurry, that he may not be able to locate it promptly, if in a central library. This feeling is not without reasonable foundation, as it is based on the irritating experience which some business men have had in using central correspondence files which, in many offices, are poorly administered and cannot produce desired information promptly. The business library, when administered by a qualified librarian, not only can produce all filed material promptly, but in one large corporation, known to the writer, has so successfully handled material that the officers and employees send their information to the library, as a safer and more reliable place to keep it for quick reference, than the drawers of their own desks.

Centralization of library material gives all the departments the benefit of everything the company has collected on a special subject, and often makes it unnecessary to duplicate information for the use of several departments.

The fact that a central library department has on record what material is temporarily or permanently kept in all the departments, makes it possible also for it to act as a clearing house between all departments in locating desired information. This principle does not apply of course to corporations of such magnitude that their activities comprise several distinct lines of business; in such a case each department would require a specialized collection of information, which would become the library of that particular branch of the industry.



The library of the People's Gas Light & Coke Company of Chicago is a most comfortable place to seek information. The room has a large fireplace at one end and the built-in book cases and file drawers are of mahogany.

enormous saving of time and money, and in large business organizations the employment of a trained librarian to do this work is a most valuable asset.

Check up if you can, the amount of time wasted annually by the average business man through lack of having the information he desires immediately at his service. Waste of time means waste of money. It is not worth while having an expert, whose time may be worth anywhere from twenty-five to one hundred dollars a day, waste any of it in trying to find information in government documents, which he is not particularly adept in locating, because he lacks a working knowledge of the enormous range of government publications.

The writer is acquainted with an engineering firm of national reputation, which has made a collection of library material, which has been cared for, or rather much neglected by a stenographer of the company, who has no time or library experience to give to its adequate administration. This firm when urged to introduce organized library service, and thus make their collection effective, stated that their library was not used enough by their organization to warrant the expense. Investigation proved, however, that one of their chief expert chemists, whose time was valued more per week than that of a trained librarian would be per month, was making a systematic business of hunting his own library material, and had listed his references in many closely written notes, in order to be able to locate the material again if he should need it. The value of the time the chemist spent on his research would have covered a librarian's salary and made it possible for him to

THE FUTURE OF THE AIRPLANE IN BUSINESS

BY C. B. MERRICK

(The problem of landing places in congested city districts is the chief difficulty in the way of the commercial plane. Landing places without the city and good roads the country over offer a simple solution, however, and the practical commercial use of the aeroplane seems an early possibility. Electricity plans an important part in training aviators and in marking landing places and guide posts.—The Editor.)

With a military truce in force and peace negotiations under way, the problems of peace move out into the foreground of the world's interests. All industries have been speeded up and non-essentials have been eliminated to bring production to a maximum. In our readjustment to normal conditions, are we going to fall back into the pre-war ruts or will the demand for speed be continued in our daily lives?



INSTRUCTING AVIATORS BY ELECTRICITY

One of the methods used for instructing the soldier aviators, in which electricity played its part. The bright spots indicate the positions of small incandescent lamps behind the screen on which the airplanes appear in various flying attitudes. These were all flashed on for the picture, but ordinarily are not visible. Aiming and firing practice is accomplished by sighting a dummy machine gun at the position ahead of the plane so that the time of travel of the bullet will be the same as that of the plane, and therefore it will reach a vital spot. After the sighting is completed, the lights are flashed on and the gun setting is checked by them. The three spots indicate the correct setting of the gun for various plane speeds of 75, 100, and 125 miles per hour.

Will we dismantle our specially equipped factories and dismiss their trained mechanics, or will we take advantage of one of the greatest gifts of the war by applying their products to peaceful conditions?

This query applies particularly to the airplane which has proved beyond question that it is a military essential to victory, and that any future army worth the name must be well equipped with the latest and best designs. This means that military research, development, and production of planes must be continued. That nation will be most successful in military planes which utilizes the largest number of planes in its peace time pursuits, and obtains the advantage gained by the experience of their use. This will also be the least expensive and least disturbing procedure in an economical way, for fewer specialized factories will have to be reconverted to other uses, and fewer men skilled in this particular art will need to shift again to other occupations. In case of future need for military production, the factories will be on a manufacturing basis

and the long and unfortunate delays in obtaining men, materials and machinery will be avoided. The result of this saved time in planes put out should be of untold value.

Time is very necessary for building a new and immense enterprise as has been proved by our recent experiences. Consequently we have just reached a maximum of production at the time when the great need is reduced to a fraction of its former value.

We now have at our disposal this magnificent equipment in men and planes to use as we desire. The knowledge gained in four years of intensive struggle is available. America has again taken up her place in the forefront of the nations, after falling ignominiously laggard in aviation matters. The airplane, perfected first in America, was allowed to become the property of other nations, quick to see its advantages, while she rested on her laurels.

The smallest aeroplane built—a factor which will greatly simplify the landing problem. It is one of the speediest machines for its size, measuring nineteen ft. in width. Is fully equipped to carry an electrically heated uniform which is worn by the pilot when riding at high altitudes. The picture is copyrighted by the Keystone View Co.



After an unprofitable siesta she has regained her place by producing and standardizing the Liberty Engine, the equal of any engine built, and by quantity production of planes. She has also recently regained the record for altitude flight, when Capt. R. W. Schroeder at Dayton, Ohio, flew to the elevation of 28,900 feet in an American built airplane, propelled by an American built engine. This is merely an illustration of the perfection to which these machines have been brought. The great war has developed specialized planes which accomplish their particular duties with wonderful ability. Accuracy of design has reached such a stage that a plane can be built with practically any desired characteristics. A speed of 150 miles per hour has been attained as well as a climbing ability of over a thousand feet a minute. Some types have been so constructed that

it is almost impossible for the pilot to damage the plane by any stunts in the air. A very general false impression prevails among the general public not thoroughly familiar with the details, that all airplanes are exceedingly dangerous for their passengers and all concerned with them, and that they are anything but substantial in construction. This is only natural in a new and extraordinary field, particularly with the secrecy imposed by war conditions. A campaign of education must be undertaken for the

much closer together. It will not, of course, eliminate the railroad and other means of conveyance but will operate in conjunction with them.

This brings us, then, to the necessities for establishing such routes. First and foremost, we must have landing fields for our regular stations, and for emergency use. All our aerial activities must start from these points, and due to present construction, these fields must permit a lengthy run for accelerating in taking the air, or for landing purposes. The shape of the grounds should be square, because a landing on a long narrow strip with a cross wind is a task for skilled pilots only. Difficulty has already been experienced in providing such landing places near our large centers. The good road then becomes a necessity to connect our landing places with the centers of population, and these good roads themselves will shorten our lines of communication. In a rolling country the cost of a level landing field would far exceed the cost of good roads to a more distant and suitable tract, while the roads will act as feeders for our planes and other transportation systems.

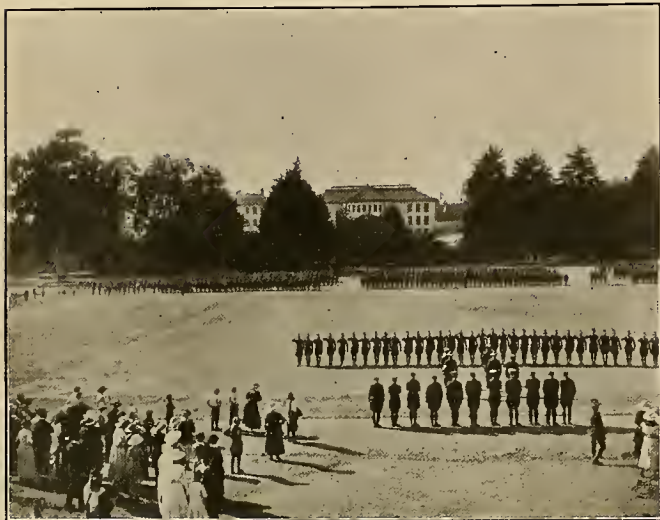
For emergency use the aviator must use the open space at hand for his landing. The radius of his travel after his engine stops, even from high altitudes where he is safest, is not over eight or ten miles, so until the country is dotted with landing spots at intervals of fifteen miles, the pilot must land as best he can. Here again the good road will serve him. A landing can easily be made on its surface, provided it is wide enough to allow for the span of his wings. Thus, undoubtedly, many serious accidents might be avoided in forced landings.

While the aviator is in the air the roads will be distinctive landmarks and guides for his use in determining his course. The more direct the roads the more value to the pilot. The future of our aviation program is then intimately linked with our policy of road building, and here in the West, the combination of the two will be as nearly ideal as possible. We have already pursued a constructive policy for our roads, and our weather conditions are such that all the year round flying is more practicable than in other localities. The gates are open for entering into a new phase of commercial and industrial methods.

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule XI. If the regular and normal progress of the work is held up due to extras or changes or other causes over which the contractor has no control, an interference or interruption charge shall be made, depending on the extent of the interference or interruption.



THE MEN WHO CAN PILOT THE MACHINES

The Aviation Cadets at the University of California, with the graduating class in the foreground. This shows a part of the men in training at one of the many similar ground schools located throughout the nation. Large numbers of our soldiers have had the advantage of this intensive and expensive training, and their knowledge is now available for developing and improving the aerial industries.

benefit of the general public, which realizing the new possibilities will be quick to grasp them:

Most of the effort has been expended in producing fighting qualities, consequently redesign and adaptation will be quite necessary for peaceful demands. This should not prove an insurmountable task, as the demands of the war, greater than any previously made, have been met so fully. The world has learned to what an extent it is dependent on its engineers for the very necessities of life, and how problems are best met by systematic and concentrated study of the subject at hand. In the future the engineers must take their place in solving the nation's economic and social problems. The world war has done an irreparable amount of damage, but the possibilities for good results are large.

The proper guidance of the tremendous impetus given to the plane design and production will place America at the head of the nations. Mail routes between our largest cities have already been established. These are being extended as rapidly as possible, and should be supplemented by passenger lines, ultimately covering the whole country. These routes may not be entirely self-supporting at the start, but should soon prove profitable because of the wonderful saving of time for their patrons. The railroads have redoubled their efforts to reduce operating time between our large cities, by minutes or possibly an hour. The airplane cuts this time to a fraction of its former value, and brings our cities

RAILWAY ELECTRIFICATION IN WASHINGTON

(Little has been heard in recent months of the railway electrification in the Northwest, but the work is progressing and it is expected that trains will operate through the Cascade Mountains by September first. Here is a review of the present status with a brief description of equipment and construction work.—The Editor.)

The Puget Sound section of the State of Washington, the scene of the state's greatest commercial and industrial activity, is soon to have its prestige greatly enhanced. About July 1 of this year, the Chicago, Milwaukee & St. Paul Railway will begin operating its trains electrically through the Cascade mountains. By this electrification much of the handicap occasioned by the existence of a high range of mountains between Puget Sound and the east will be removed.

The electrification covers 218 miles between Othello in eastern Washington and Seattle and Tacoma, and such was the consequence of the work that it has not been interrupted by the fact of war. The poles and fixtures necessary to the support of the power-transmission wires, as well as those for the trolley, feeder and other wires, are practically in place. Between Othello and Tacoma the substation buildings have been finished and much of the substation equipment installed.

Progress on Substations

There are eight substations situated approximately 28 miles apart, of brick construction with tar and gravel roofs. The roofs are flat with two exceptions, these being in the region where the snow fall is heavy. The substations are at Tacoma, Renton, Cedar Falls, Hyak, Cle Elum, Kittitas, Doris and Taunton.

Taunton substation is 9.2 miles west of Othello, where a connection is made with the Long Lake hydroelectric station of the Washington Water Power Company, by a 110,000 volt transmission line 170 miles in length and a connection is made at Cedar Falls substation with the Snoqualmie plant of the Puget Sound Traction Light & Power Company, where a substation is being erected by the last named company in which the generator voltage is to be stepped up to 110,000 for transmission to the railway company. The new substation of the traction company will contain three 4500 kva. transformers, General Electric type, and one held in reserve, all outdoor installations. Special type of large disconnecting switches is also included, being supplied by the Electrical Engineers' Equipment Company, Chicago. The Milwaukee constructs its own transmission tie lines.

Power Line Construction

For the power-line construction between Taunton and Cedar Falls the Milwaukee company is to make use of 6-strand No. 00 copper cable with hemp center which makes a 133,000-circular mil cable with a diameter of 0.446 inches. From Cedar Falls to Renton and Tacoma by way of Snoqualmie Falls, the line has six strands with hemp center and cable diameter of 0.938 inches. For the Long Lake-Taunton line seven No. 8 wire are used, which gives a cable of 0.3855 inches and 115,000-circular mil area.

Details of Equipment

The substations were built by the Milwaukee Company. They are T-shaped with a 50 by 84 foot high-tension room in the rear, and a 40 by 60 foot room in front for the motor generator set. The Westinghouse Electric & Manufacturing Company is equipping the substations at Taunton, Dorris and Kittitas and the General Electric Company those at Cle Elum, Hyak, Cedar Falls, Renton and Tacoma. At Taunton and Tacoma the stations are two-unit with two units to be installed. Cedar Falls, Doris and Hyak are three-unit stations, with two units installed at each point. At Cle Elum and Renton the stations are two-unit with one unit installed in each case. These units are all 2000 kw.

The type of equipment installed by the respective companies in these substations will be understood from the following descriptions: Westinghouse Electric & Manufacturing Company installed the equipment in the Taunton substation. This substation contains two oil insulated, self-cooling tubular type transformers for indoor service. They are of the shell type, 2500 kva., three-phase, 60 cycles, with high-voltage winding for 102,000 volts, and low voltage winding for 2300 volts. There are additional taps on the high-tension winding to give 97,200 and 92,400 volts at full capacity. Taps for 1150 volts are provided on the low tension winding to supply the starting voltage for synchronous motors of the motor generator sets. The transformers are connected in star on the high-voltage side and in delta on the low-voltage side. Each transformer is connected and has the corresponding capacity for supplying one motor generator set.

Flat coils make up the high-tension windings to make sure that the low-voltage stresses between coils is kept low. Each of these coils is wound with layers of thin copper ribbon, which is bare, but as the coil is wound the conductor is automatically insulated with layers of paper and cloth applied through a folding tool.

Taps are placed in the body of the high-tension windings rather than at the ends to avoid exposure to the effects of line surges. Low-tension coils are made up of rectangular copper conductors in multiple, each covered with two layers of cotton insulation. Transformer tanks are made of boiler plate, with cover bolted to the top, a gasket between tank and cover to make them air tight.

Leads and taps from high-tension coils are connected to the terminals, which are carried by insulating supports mounted upon the barriers between the coils. This makes a terminal arrangement free from grounded supports. The three high-tension leads are carried through the cover by bushings of the condenser type. The five low-tension terminals are brought through bushings in the cover, terminal boards being mounted inside the transformer case.

There are two motor generator sets in the substation, each consisting of 1000 kw., 6-pole, 1500 volt direct-current generators connected in series and driven by a three-phase, 60 cycle synchronous motor, the motor and two generators being on the same shaft and bedplate. The shaft has an exciter at each end, one for the generators and one for the synchronous motor. The normal full-load output of each set is 2000 kw. at 514 r.p.m., 3000 volts, 667 amp. Exciter for generators is rated at 10 kw., 125 volts; exciter for the synchronous motor is rated at 30 kw., 125 volts. By a special winding the power-factor on the motor is automatically held at 95% leading when delivering maximum load, with provisions for adjusting the power-factor setting to give unity or leading power-factor between one-half and full load.

Feeders of the power company are controlled by 110,000-volt, 200 ampere, remote controlled, hand operated oil circuit-breakers which have a very high ultimate rupturing capacity at the arc. Bushing-type current transformers operating the protective relays are provided for these. From a panel located in the middle wall each coil circuit-breaker is controlled and upon which is mounted the controlling, operating and indicating mechanism and disconnecting switch. The incoming power line and railroad 3000 volt feeder lines are equipped with static voltage detectors. Nine panels are contained in the chief switchboard. There is one resonant shunt to be connected across the 3000-volt direct-current busbars, to be so proportioned that it will shunt out the harmonics caused by slot action in the machines.

The Westinghouse flash suppressor is a feature of the equipment. This is a combination of electrically operated switches that work to create a short-circuit across the collector rings on the armatures of the direct-current generators, acting at once upon any sudden rush of current greater than that for which the combination is adjusted. The result is to kill instantly the direct-current voltage and suppress any tendency to flash over at the generator commutators.

Cedar Falls Substation

The Cedar Falls substation was equipped by the General Electric Company and has two 2000 kw. motor generator sets, two 2500 kva. step-down transformers, and switchboard equipment. The oil-cooled transformers have steel plate tubular tanks and the high-voltage winding has approximately 5 per cent taps. The low voltage is provided with approximately 50 per cent starting taps in the same manner as those contained in the Westinghouse equipment. If the total rated capacity available on busbars or circuits to which switches are connected does not exceed specified limits, the oil switches can safely protect the machines and feeders under short-circuit conditions. The 110,000-volt circuits of the power company and the railroad transmission lines are controlled by large circuit-breakers, while the transformers are controlled by 100-amp. circuit breakers. As is the case with the Westinghouse substations, these oil breakers are operated from panels located in the middle wall.

The two motor generator sets each consist of one 2300-volt, 2500 kva., three-phase, 60 cycle synchronous motor, started from transformer taps, direct-connected to two 1500-volt, 1000-kw. generators, connected in series for 2300 volts direct current, and two 125-volt exciters rated at 30 and 10 kw. The switchboard consists of a panel for each of the motor generator sets, panels for two 2300-volt direct-current feeder circuits, storage battery panel, auxiliary light and power panel for station use, a panel for the power company meters and one for power limiting equipment.

The 3000-volt direct-current feeder lines are continuous between substations with taps to the trolley line every 1000 feet. Return circuits are made up of a No. 4/0 copper cable strung on the feeder-line poles connected at intervals of 8000 feet, to the running rails. This cable is to prevent the interruption of circuit and dangerous voltage at the rail joints if bonds are broken. Necessary current for automatic signaling is also transmitted by the running rails so that the only cross connections between main-line tracks will be the reactance bonds when connecting with signals.

The catenary type of trolley construction is used and consists of two standard No. 4/0 grooved wires for which hangers are alternately spaced and separated for each wire by an average distance of 15 feet. There is no rigidity of connection between the two wires. Thus flexibility of support is provided, giving the increased trolley contact surface and current carrying capacity necessary in high speed conditions. One trolley wire is all that is provided on passing tracks and yard tracks. The normal height of the trolley wires above the top of the rail is 24 feet 2 inches, while the minimum height, having relation to bridges and tunnels, is 19 feet.

Westinghouse Electric & Manufacturing Company is also furnishing a power indicating and limiting system apparatus. Similar apparatus has been in operation for some time on the Milwaukee Company's Rocky Mountain Division in Montana and consists of providing a convenient means of measuring and recording at some designated point, the entire power necessary to operate the newly electrified territory, and providing the means by automatic lowering of the direct-current substation voltage of limiting the maximum demand or the output of a particular substation to a certain predetermined amount. The indicating and limiting apparatus in the substations and dispatcher's office is connected by a circuit consisting of two No. 8 B. & S. copper wires on the trolley poles. This circuit extends from Taunton, the most easterly substation, passing through each substation to the dispatcher's office, its frequency in any section being dependent on the load in the substations east of that point.

Locomotive Design

Locomotives for this line are being built by the Westinghouse Electric & Manufacturing Company and the General Electric Company, ten by the former and five by the latter.

The Westinghouse locomotives will have two main running gears, each having a four-wheel guid-

ing truck, three driving axles in a rigid wheel base, and a two-wheel trailing truck. The whole running gear will be composed of two Pacific type running gears coupled together with the two-wheel trucks on the adjacent ends. On the running gears a single cab will be mounted. Motors will be of twin armature four-pole type, having two armatures connected permanently in series and carried in a common frame. These two armatures are to be geared through a single gear to a quill surrounding the driving axle and carried in bearings in the motor frame.

The General Electric Company locomotives will be of the through passenger type and will be equipped with steam heater, train lighting apparatus, and 12 gearless motors; two four-axle rigid trucks, and three axle guiding trucks. A separate cab in the center will contain the heating equipment. That portion of the cab extending toward the end of the locomotive from the operating cab will have a rounded form resembling to an extent the shape of the present steam locomotive ahead of the engineer's cab.

It will not be necessary to purchase freight locomotives as the present locomotives used for passen-

ger service will be changed in their gears so as to adapt them for freight service. The passenger service will be handled by the new locomotives above described. Each of these locomotives will have a capacity corresponding to that required to haul a load of 960 tons or about 12 cars, in a continuous run over any part of the profile between Harlowton, Montana, the eastern terminus of the present electrification, and Tacoma and Seattle. The speed varies from 60 miles an hour on the level to 25 miles when ascending the heaviest grades. Under the plan of control regeneration will be permitted on down grades.

This is the most extensive electrification of its nature now being carried through. Taking into consideration the 440 miles of line which the Milwaukee company previously electrified between Harlowton, Montana, and Avery, Idaho, the company will have on July 1st of the present year 660 miles of trunk line electrified.

Engineering and construction work are being handled by the electrification department of the company. R. Beeuwkes is electrical engineer in charge, and F. B. Walker superintendent of construction.

SELLING ELECTRICAL GOODS IN CHINA

(West Coast trade with the Orient is again taking shape—and awaking to the vast possibilities in the practically undeveloped field of China. The United States as a nation stands well with the Chinese and American goods have a good name,—it remains only to take advantage of that country's needs and tendencies of growth as they are pointed out in these interesting extracts from the report of a special investigator in the Orient.—The Editor.)

Growth of Electrical Imports —

Those who have never been to China are likely to think of this nation of ancient civilization as it was presented to them in their school geography. They have not comprehended a change in other parts of the world similar to that in our own. As a matter of fact, however, there has been a gradual development in that country due to more intimate contact with foreign civilization, to better transportation facilities, and to a slowly increasing earning power.

In the sale of electrical goods, prime movers, machinery, propellers (as boilers, turbines, etc.), the pre-war years showed the imports from the United Kingdom to represent 65 per cent of the total, while the direct imports classified under "electrical material and fittings" showed that less than 8 per cent came from the United States.

The people of China have shown a progressive tendency and with its great population and increasing purchasing power, an increase of a very small percentage of the people will make a large aggregate. As an instance, it is shown that one per cent of the population aggregates three times the population of New Zealand alone. Not only do the numerous wealthy merchants and officials appreciate modern conveniences and comforts, but as one passes along the streets where electricity is available he is struck by the number of small shops that have electric lighting. Not only this, but they appear over rather than under lighted, showing they are liberal consumers.

The strong present market lies in the furnishing of apparatus and materials for new stations. This market is being developed faster than one would expect.

Future Possibilities —

While a fair volume of electrical trade is possible now, the great volume of trade with China will come with the greater development of the country; this will increase purchasing power, which will result in a more extended use of electrical service. Combined with earning power, education will also result in better living and everything that goes to make up a higher standard of living.

Conditions of Trade —

Those who wish to meet success in entering this market must bear in mind that first of all they must arrange for proper representation; that, secondly, they must have goods adapted to the needs of the Chinese under existing standards; and that they will find it a great advantage if their representatives in China are able to extend moderate terms of credit to native companies that may buy central station apparatus and materials. American goods have a good name and the United States as a nation stands well with the Chinese. If American electrical manufacturers are willing to cultivate the market in a broad-minded, thorough manner, China affords an export market almost as rich in its potentialities as all of South America. It is relatively a small market

today, but—and this may be of advantage—a great one tomorrow.

This information, together with an interesting description of the climatic and living conditions; language and educational facilities; postal and transportation facilities; agriculture, mining and timber resources; manufacturing industries, and a complete account of the electrical industry, is given in a bound illustrated monograph, comprising over one hundred pages, issued by the Bureau of Foreign and Domestic Commerce under the title "Electrical Goods in China, Japan, and Vladivostok," written by R. A. Lundquist, Trade Commissioner of the Bureau, who was sent to those countries by the government for the purpose of making a thorough investigation at first hand.

From this account we learn the two main amusements of the Chinese appear to be their theaters and teahouses. Attending a Chinese theater in a large port one evening, the writer was struck by the good ventilation, in spite of the fact that both men and women were smoking. The electric lighting also was ample and was disposed so as to have little unfavorable effect on the eyes. Electric fans on both ceilings and walls were in operation.

Of interest to engineers is the fact that at Canton a store termed "universal providers" not only has all the usual appurtenances of an American department store, but recently added a foundry department and a machine shop, which is a step ahead of their American contemporaries.

It is impossible in a review of this kind to give electrical goods, and those interested are therefore directed to Mr. Lundquist's report. It may be said in passing, however, that a complete analysis is given of central-station, development factors, practice and management, of generators, switch-board and switch gear; transmission and distribution equipment; underground cable; bare and weatherproof wire; poles and towers; crossarms, insulators, and pipe-line hardware; transformers; street lighting fixtures; motors and controlling apparatus; electric railway equipment; meters and testing instruments; lamps; batteries; electric-vehicles; farm-lighting plants; telephone and telegraph equipment; wiring supplies and lighting fixtures; fans and other domestic and office appliances and other electrical equipment.

Market for Special Apparatus —

It is but possible to make reference in a general way to a few of these. We learn that while a great amount of bare wire is used, the tendency seems to be toward the use of weatherproof rather than uncovered wire for distribution lines and in the past most of this has apparently come from Germany or England. No triple-braid weatherproof wire so far seen comes up to good American wire in quality, and prices are not materially lower than those that could be made by manufacturers in the United States.

Insulators are of porcelain, generally white in color, and are usually bought complete, with pin and washer. In the past Germany, England, and the United States have sold in this market.

Prior to the war the chief competitors in the field for transformers were one of the American

companies, a German, and two of the large English companies. American transformers used in China have a very good reputation, only one complaint being made. This was in regard to small-size three-phase units, of which the general criticism was made that they were not so satisfactory as the best British transformers of the same type.

In the past street-lighting fittings have come from England, Germany and the United States, but in future Japan will be a competitor.

The gradual electrical development in China is bringing an immense market for motors. The business will not be in large units as a rule, but rather the reverse, since a great deal of the demand will be for low-horsepower motors for work that has hitherto been done by hand, horses, or by mules, such as small rice or bean-oil mills and machine shops. The development of railroads will bring a large market for motors, since electric drive will be employed in all new railway machine and repair shops, and mining on a large scale will also create a broad field for the sale of electrical power apparatus of all kinds. In addition there will be more cotton mills, silk filatures, cement mills, cold-storage plants, etc., which will mean increased demand for electric motors. From this development will come the market for larger-type motors, but the volume of business during the next few years will likely be in the smaller capacities, motors of 2 to 25 horsepower.

In the past England, Germany, and the United States, with Japan a growing factor, have supplied most of the motors used in China. In direct-current lines, American motors are generally high in price, the British and Germans competing with each other closely in normal times. In alternating current motors the American manufacturers compete well, quality considered, and in single-phase lines they show not only better operating characteristics, but lower prices as well.

Single-Phase Motors —

In Shanghai, American single-phase motors have not been strongly represented in the past, apparently, but if properly pushed there are several makes that can do considerable business there. American single-phase motors are the best in the market, the only strong competition noted coming from England. The British competition can readily be met when American motors are locally represented, and well-known American designs are being sold to British central stations, owing to their marked superiority and better price. This is one of the few instances where higher-quality American apparatus sells at a lower price than its inferior foreign competitor.

While American manufacturers will not be likely to do much business in direct-current motors, of which there is a great amount anyhow, they should sell a considerable number of alternating-current motors in spite of a somewhat higher price.

The market for electric elevators is small, though growing, and is confined to a few of the largest cities. The Chinese are good builders and like

to have elevators in buildings where there is any need for them.

Portable Instruments —

At present China presents only a limited market for portable instruments, but in this line American manufacturers may do a little better, since quality is more of a factor in this type of instruments than in panel meters. One field for portable instruments, and switch board types as well, that American manufacturers can cultivate is the market afforded by the development of the technical school in China. By furnishing instruments to these schools at a small margin of profit at the start, not only is there an opportunity to secure such business in the future at better prices, but the student will become accustomed to good instruments and will not be satisfied to use inferior meters when he completes his course and takes a position in a power company.

The meter business is growing rapidly, as new plants are being installed. In 1918 they were imported in the amount of over \$40,000. The market is largely for alternating-current types. The American alternating current meter can compete with foreign makes. Prior to the war only one American manufacturer seemed to be at all active, but since then two or three others have arranged for representation and have sold a fair number of meters. Foreign meters do not have the quality of American meters. Not only are they less accurate over a period of time, but they seem to deteriorate more quickly under the climatic conditions.

American exports of batteries have been of fair value, the amount being (for China and Hongkong) in 1918, \$34,419. In the dry-cell line American manufacturers are in a better position and there is a good market, the majority of the telephone systems being of the magneto type. The climate is such that cells do not dry out as in some countries and the normal life is longer. There should be an opportunity for American manufacturers to do a fair amount of battery business in connection with the sale of electric vehicles.

Telephone Equipment —

In equipment and in telephone instruments since the war began, competition has dropped to practically nothing, and the United States and Japan are furnishing the market, with a few others coming in. When normal conditions are re-established, it is believed that American telephone manufacturers will be able to compete readily for exchange equipment and subscribers sets.

Before the war British and German cable held the market. On the other hand, an American telephone engineer in China said American manufacturers could compete with other makes of telephone cable. In other classes of line materials, besides cable, American manufacturers can furnish such items as steel pins and pole hardware to some extent. Very little in telegraph line has been bought in the United States.

Before the war American, British, German and Dutch, and to some extent, Japanese wiring materials were on the market. British and German houses sold the bulk. In wire England and Germany

sold the most, with the United States getting a little business. Now the United States, the Netherlands, and Japan have been supplying the market, with the Netherlands dropping off as shipping conditions became acute.

Screw sockets of both American and Japanese manufacture are being sold in China, the latter resembling American types and many being made by a Japanese manufacturing plant in which American capital is invested. These latter sockets made in Japan are not so good as those made in the United States, however, according to users. While Japan will be a serious competitor in this line, it is believed that American manufacturers can compete in normal times, both in standard types and in a type similar to those developed by Germany.

Electric Fans Popular —

Only one item in general domestic and office appliances is selling to any extent in China; that is the electric fan, which is universally used on account of the hot, humid summer weather, and which is one of the most important of American electrical exports to that country. In 1918 those exported amounted to \$173,520, the American trade having trebled when the war removed European competition. At present half a dozen good American fans are on the market.

Fans not only are given severe usage in China, as they are often operated continuously for a whole day or more, but the humidity causes insulation leaks and breakdowns. It was said by one dealer that a certain American fan was the only one that can be run continuously without difficulty, that Japanese fans get hot quickly and also show leakage. In ceiling fans American types have an excellent hold on the market.

It appears that it is possible that certain types of small American signs for use in windows can be sold in China. The Chinese appreciate sign advertising and seem willing to use electricity in connection with it.

While there will be a small but increasing demand in China for the best in all lines of electrical goods, coming from the wealthy Chinese as well as from foreigners living in the country, importers state that China, generally speaking, wants apparatus and similar large equipment of the best, but that in minor devices, supplies, and accessories the cheapest will be favored.

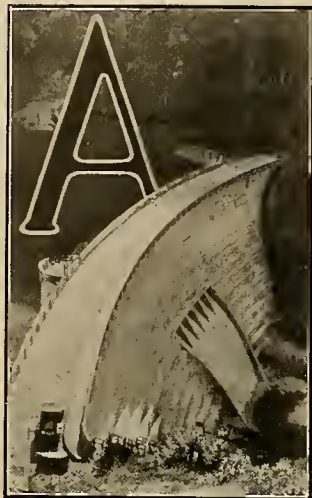
A considerable number of Chinese have taken engineering degrees at American universities and many have later spent some time at work in American factories and plants. Returning to China these men can be and are a factor in shaping the demand for American standards in electrical work. In the United States they have been accustomed to American station equipment and practice and when they take up engineering work in their home country they try to adhere to these standards.

Considerable space is given in the government report to the methods of selling goods in China so that those who are desirous of exporting to that country will be able to familiarize themselves with all the conditions and requirements necessary to give prompt and satisfactory service.

RECENT DEVELOPMENT OF MARIN WATER DISTRICT

BY H. M. BOWERS

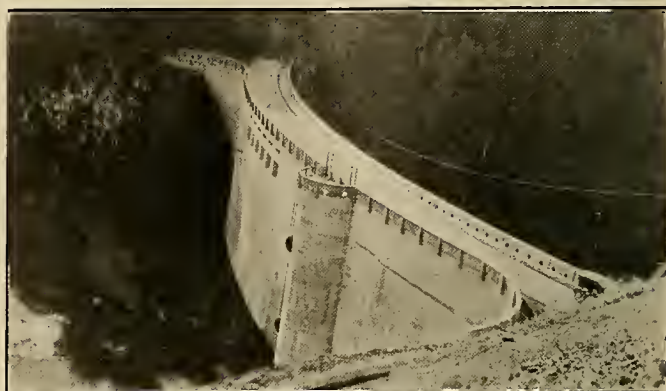
(An attractive dam recently completed near San Francisco makes use of the siphon type of spillway. An interesting feature of the development is the restricted size of the watershed where a small area with very heavy rainfall provides the water supply for a populous district. The following description and construction data are contributed by the assistant engineer on the work, in charge of official detail, designing, detailing and estimating.—The Editor.)



The dam completed. The apron of the spillway is here clearly shown

WATER supply development of considerable interest, which has just been completed, is that of the Marin Municipal Water District in Marin county, California. The district was organized in 1912 under an act of the legislature, usually called the Water District Act, which provided for the combination of small municipalities into an association to develop a common water supply system. The boundaries of the district are not identical with those

a draft would not be exceeded within the next 50 or 60 years. This would require a dam 170 feet high, a tunnel $1\frac{1}{2}$ miles long and pipe lines sufficient to carry the water to the distributing system. Only



Upstream face of the dam,—showing the openings to the six siphons. The crest of the siphons is only 5 ft. below the crest of the dam, thus saving nearly all of the reservoir capacity.

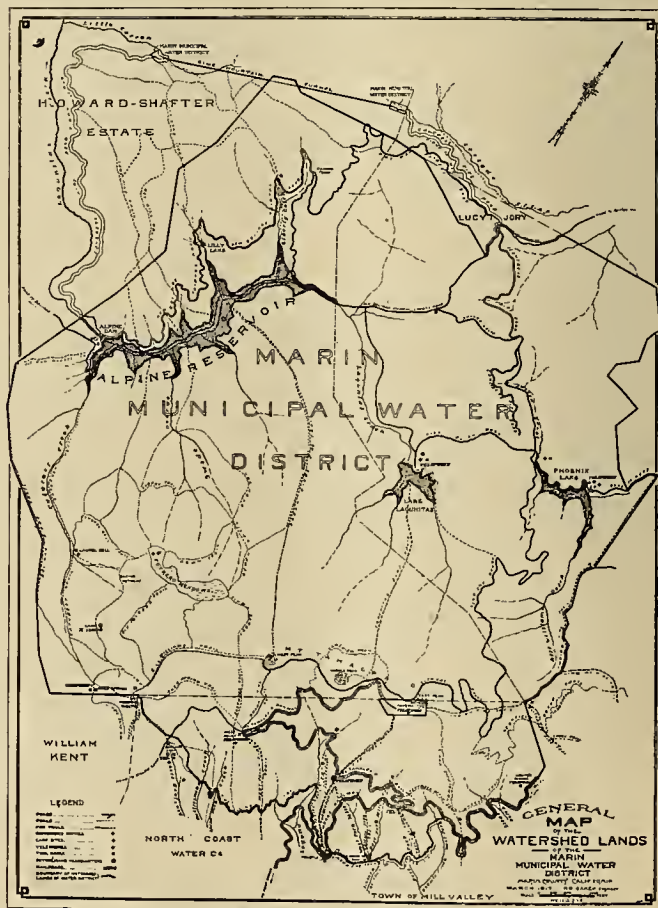
of Marin county but take in the most thickly populated portions and include San Rafael, San Anselmo, Fairfax, Ross, Kentfield, Larkspur, Corte Madera, Belvedere, Mill Valley and Sausalito, as well as a considerable amount of adjacent territory.

Necessity for Increased Storage

Before the district was organized these towns were supplied with water by a number of small companies acting independently of each other and which were taken over by the district. The principal ones of these companies were the Marin Water & Power Company and the North Coast Water Company. As soon as the district was formed Mr. A. R. Baker was employed, as engineer, to study the existing systems and the possible sources of supply, keeping in mind the probable needs of the community in the future as well as the needs of the present time. The existing companies were found to be able to supply somewhat more than 3,000,000 gallons per day and to have distributing systems which would approximately meet the immediate requirements and were susceptible of extension as occasion might require.

To increase the supply, more storage had to be developed. The Marin Water and Power Company had two small reservoirs—Lagunitas and Phoenix Lakes—but the capacities of these could not be much increased and Phoenix Lake had the disadvantage of an elevation such that the water from it had to be pumped. The Russian River was given consideration as a source of augmented supply but was soon rejected and the study was then confined to a comparison of the different ways in which the Lagunitas watershed could be developed. It was found that this watershed would provide for a daily draft of 15,000,000 gallons if fully developed and that such

the tunnel, however, required immediate construction to its final dimensions, as the dam could be built to a lesser height at first, then increased later, and additional pipe lines could be added as needed.



The extent of the Marin District.

The Construction of the Dam

Of the three main features of the new work,—Alpine Dam, Pine Mountain Tunnel and the reinforced concrete pipe line—perhaps the one of greatest interest is Alpine dam. This is a dam of mass concrete, of the gravity type, and is curved in plan to an upstream radius of 465 feet. It has a height of 100 feet, a crest length of about 350 feet, and

from near the surface of the lake and so that the gates may be operated under low pressure. A fourth set, placed at the bottom of the tower and discharging through a scour pipe, admit of draining the reservoir and wasting the water into the creek below the dam.

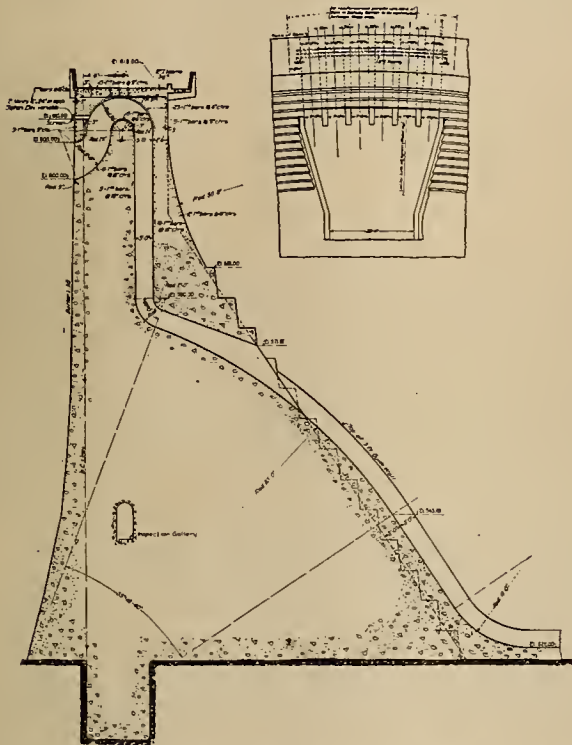
The Siphon and Spillway

A feature of Alpine Dam which may be of more than usual interest is the siphon spillway through the central portion of the dam. During the greater part of the year the discharge of Lagunitas Creek is small, but the watershed above the dam, with an area of a little more than ten square miles, is subject to extremely heavy rainfalls and stream measurements showed that to make the spillway entirely safe it would have to be designed to discharge a maximum of 4000 second-feet.

Since the reservoir is for storage purposes and since a small variation of the elevation of the water surface causes a relatively large variation in the quantity of water impounded, it was important to keep the crest of the spillway as high as might be practicable for the height of dam adapted. As the canyon banks rise steeply on both sides for long distances above the dam, thus affording no natural condition favorable for a spillway separated from the dam, it was necessary to provide one either through the body of the dam or around one end. A few computations and trial designs showed that the ordinary spillway of the overflow-weir type would have to be so proportioned that it would sacrifice a large amount of the storage capacity of the reservoir, or else be very long. A long spillway through the body of the dam would have used so great a part of its length as to have nearly converted it into a dam of the overflow type. This it was desired to avoid. A further difficulty was that since the county road had to cross the dam such a spillway would have required a bridge along a large part of the length of the dam and added materially to the cost.

The method of conducting a large discharge around one end of the dam was also found to be an expensive one. The slope of the bank is about 35° and it would have been necessary to build a long overflow wall upstream nearly at right angles to the face of the dam and then to have excavated a channel in the steep hillside of such dimensions as would carry the water. Such an excavation would have been very heavy and expensive and might have required expensive protection against slides, which would have been most likely to occur at the time when the spillway would be most heavily taxed. Such a spillway would have to be bridged along its whole length to provide for the roadway.

The consideration of the siphon showed that six siphons, each $3 \times 7\frac{1}{2}$ feet in cross section, with downstream legs of such length as to utilize full atmospheric pressure, would readily discharge the quantity of water for which it was necessary to provide. The six siphons were located in the central portion of the dam with three feet of partition wall between adjacent ones, thus making the portion of



A profile view which gives a clear idea of the nature of the siphons. The location of the inspection gallery and the upper finish of road and overhung sidewalk are also indicated.

contains 27,700 cubic yards of concrete. As nearly as was practicable, concrete of a mixture of $1:2\frac{1}{2}:5$ was used in the cut-off trench, in the upstream face for a thickness of 5 feet, in the intake tower, spillway section and about the outlet and scour pipes through the dam. In the other parts a mixture of $1:3\frac{1}{2}:7$ was used and the specifications permitted the use of large stones to such an extent as might be economical. As built, the dam contains some plum stones but their inclusion did not seem to be of much benefit from the standpoint of economy and the percentage of plums is small. For the upstream face of the dam 6 lb. of hydrated lime was used with each sack of cement.

The intake tower is semicircular in form. It is built against the upstream face of the dam and made monolithic with it. The tower is divided into two compartments by a concrete partition, one of the compartments being dry and containing the control valves. Water enters the tower through 18-inch circular sluice gates and cast iron pipes, passes through the gate valves and empties into the wet compartment, falling in this to the level of the outlet pipe through the base of the dam. There are three sets of sluice gates and gate valves arranged at different elevations so that water may always be drawn

the dam affected by them only 60 feet in length. The siphons discharge between two guide walls running down the back of the dam, converging somewhat toward the lower toe and discharging the water into the bed of the creek at its lowest point. The crest of the siphons is only 5 feet below the crest of the dam, thus saving nearly all of the reservoir capacity. No difficulty was found in supporting the roadway over the siphons as the spans of $7\frac{1}{2}$ feet were provided for by reinforcing steel bars, except at the thinnest portion in the crown, where three 18-in. I beams were embedded. Each siphon is provided with two air vents, 6 by 24 inches, leading from the face of the dam into the siphon chamber at the elevation of the siphon crest, thus causing the siphon to "make and break" automatically.

Other features of the dam are an upper inspection gallery 4 by 7 feet, inclined and lower galleries 3 by 6 feet, drainage wells spaced 10 feet apart, three contraction joints, grout holes and pipes. Two rows of staggered grout holes, the holes in each row

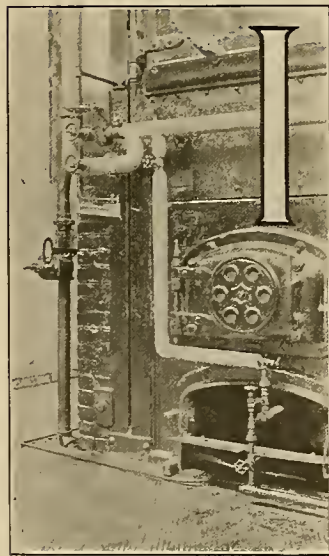
being 15 feet apart, were drilled into the bed rock along the cut-off trench. From the tops of these holes iron pipes are led to the inspection galleries. No grouting of these holes was done during construction and because of the unusually good character of the foundation it is believed that none will ever be needed. But these holes provide a ready means of thoroughly grouting the foundation in case leakage under the dam shall ever occur in such quantity as to make grouting advisable.

Rock was quarried from the hillside above the dam at an elevation such that it passed by gravity through the bunkers, crushers and mixers to cars which distributed the concrete to the different portions of the dam from a temporary construction trestle. Because of the heavy cost of hauling sand from the railroad a sand machine was installed which ground rock into sand, a little too coarse for a good mixture, but by adding about 25% of Antioch sand to that from the sand machine a very satisfactory grading was obtained.

SAVING THE WASTE IN THE CHIMNEY---V.

BY ROBERT SIBLEY AND CHAS. H. DELANY

(Data from actual operating conditions devoid of the artificialities of special high economy tests are capable of usefulness difficult to overestimate. The following is a description of an actual operating test at one of the steam power plants operated by fuel oil in San Francisco and illustrates what may be done in the boiler itself toward "Saving the Waste in the Chimney." The article is by the authors of the recent book on "Elements of Fuel Oil and Steam Engineering."—The Editor.)



Boiler—oil fired—selected for test under operating conditions—Fig. 1.

IN order to try and increase the efficiency and capacity of the boilers, certain changes were made on one of the boilers in one of the large power plants of San Francisco, as shown in Fig. 1. To determine what improvements had been effected a series of tests was run before and after the changes were made. This article includes a description of what was done to the boiler and tabulations showing readings taken during the test and the results

derived from them. The amount of oil burned in the furnace was measured by a meter and the amounts of steam generated and steam used by the burners were measured by General Electric flow meters.

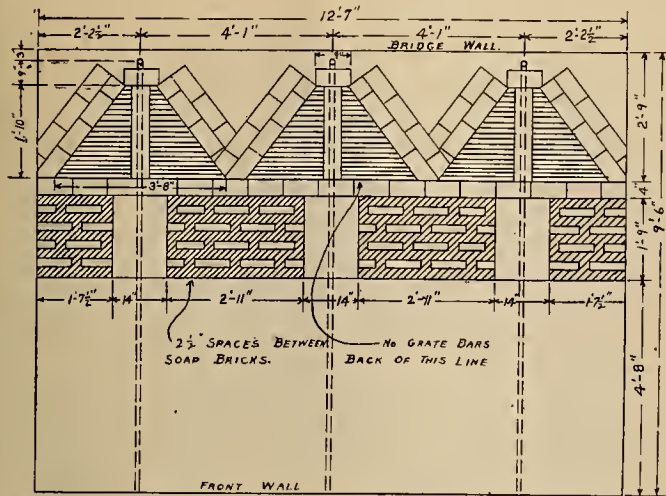
General Furnace Arrangement.—Before making the changes, the furnace in the boiler was arranged as shown in Fig. 2 and the baffles between the gas passages were located as shown in Fig. 4. Most of the baffle bricks in front of the flame plates between the 1st and 2nd passes were missing, thus allowing a large percentage of the gases from the furnace to pass directly into the 2nd pass, the flame

plates themselves having been burned away in a number of places. The space between the bottom of the rear baffle and the bridge wall was also very small as shown on the sketch. This was remedied by moving back the bottom of the baffle to a position as shown in Fig. 5. All of the flame plates which were in bad shape were renewed and new bricks put in front of them, thus making the new baffles as tight as possible.

The furnace arrangement as shown in Fig. 2 was changed to conform to the arrangement as shown in Fig. 3. New grate bars having wide air spaces were also installed, a 2 ft. 6 in. bar being used next to the bridge wall and a 3 ft. 6 in. long bar next to this. These bars which are shown in Fig. 6 have a net free area of about 65%. The checkerwork and housings installed around the burners are shown in Fig. 7.

New piping was installed for the steam and oil to the burners. The general view of the piping and other details of the boiler front is shown in Fig. 1. The flanges inserted for bringing about an arrangement for limiting the steam to burners had a steel disc inserted between them, this disc having a $\frac{5}{16}$ inch hole drilled through it. When the boiler is running at rating all the steam for atomizing passes through this hole, the lower valve on the by-pass around the disc being closed. When it is desired to carry a heavy load on the boiler the lower or by-pass valve is opened and enough steam can be obtained for any overload desired. The valves having rising stems, one can tell at a glance whether the by-pass valve is opened or closed.

The damper control was brought to the front



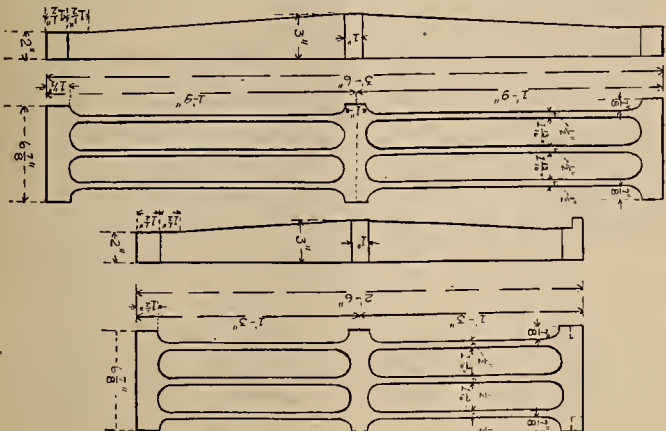
Furnace arrangement before making the changes for the test—Fig. 2

of the boiler and arranged so that the damper could be opened or closed in very small increments. It was found that the damper did not fit tight all around as proved by the draft readings taken in the boiler with the damper and ash pit doors closed as tight as possible. This defect was not completely remedied as there was still some leakage at this point during the tests.

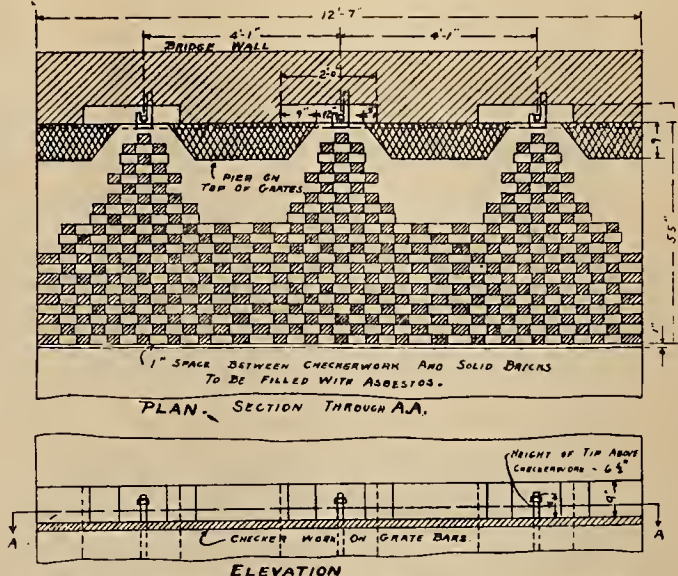
The location of the peep hole in the south wall was changed so that a view of the front walls and tubes for some distance back from it could be obtained. This enabled the operator to see the end of the flame at all times and to determine when the fires were smoking. Peep holes were also put in the side walls close to the burners so that the flame and furnace could be observed at these points.

By building a small wall in front of the mud drum and laying a plate from the top of this wall to the mud drum, the possibility of gases getting under the drum and by-passing the 3rd pass was eliminated. A plate of 14 inches wide was laid on top of the upper tubes and against the back headers, the effect of this being to force the gases to pass over the entire tube surface in the rear pass.

Tables Showing Economy Data.—The following tables show the operating conditions and loads which could be carried on this boiler before and after the changes were made and the boiler cleaned. These tables show the average of the 15 minute readings



Sketch of grate bars used during the test—Fig. 6



Furnace arrangement after making the changes for the test—Fig. 3

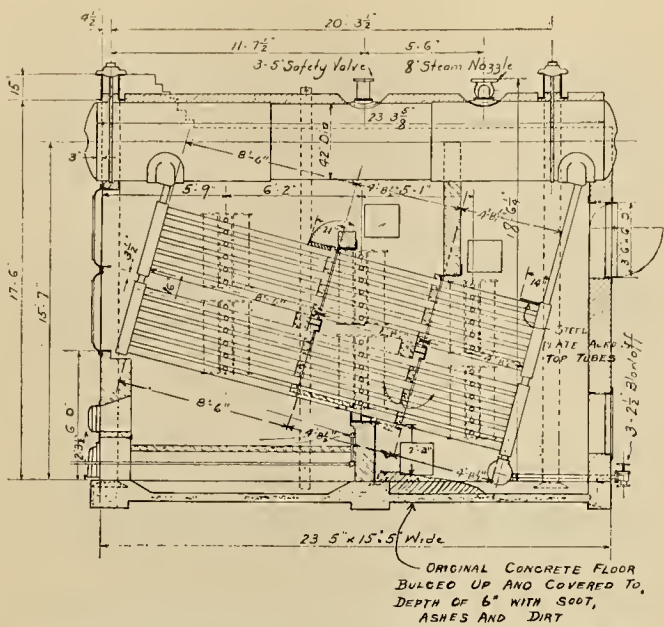
during the periods for which the tests were run. In all cases the conditions remained practically constant during the run.

The first table shows the tests made on April 19, 20 and 21 before any changes had been made on the boiler, except that before the trials of April 20 the soot was blown from the tubes. This accounts for the much lower flue gas temperature for the first test on April 20 as compared with the evening test of April 19, at approximately the same load. The test of April 21 shows the maximum load which could be obtained on the boiler prior to the changes.

The fourth column in the second table shows the maximum load carried after the changes had been made. The following summary shows a comparison of the two maximum loads run:

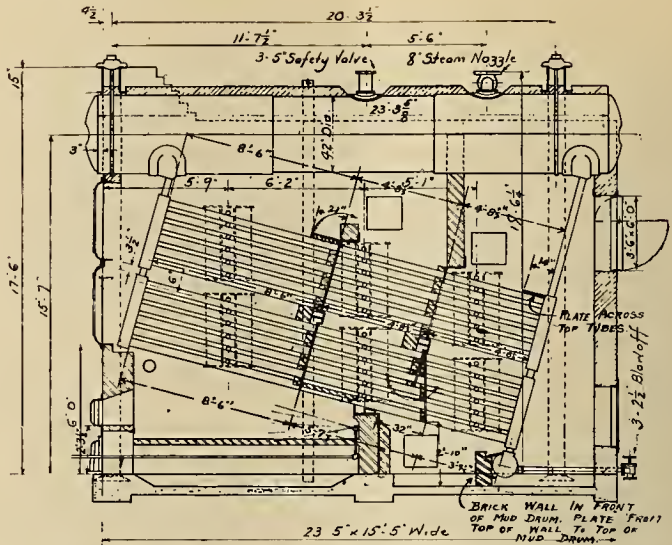
COMPARATIVE ECONOMIC RESULTS		
	April 21 Before changes had been made	May 14 After changes had been made
Boiler pressure	196 lbs.	199 lbs.
Oil pressure	52 lbs.	55 lbs.
Oil temperature	177°	180°
Draft in breeching	.225"	.315"
" " top 3rd pass	.21	.271
" " bot. " "	.21	.243
" " " 2nd " "	.155	.171
" " top " "	.039	.066
" " " 1st " "	.016	.042
" " furnace	.083	.096
" " sh pit	.078	.103
Temp. of flue gases	610°	642°
Load on boiler	755 h.p.	972 h.p.
Per cent of rating developed	144%	186%
Gross efficiency	69.5%	76.4%
Steam to burners	4.28%	3.37%
Net efficiency	66.5%	73.82%

Conclusions from Test Data.—Thus the capacity of the boiler was increased from 144% of rating to 186% of rating, a net gain of 29% in the amount of steam generated. At the same time the net efficiency has been increased from 66.5% to 73.8%. This increase in net efficiency, it will be noted, has been helped out by the saving in the amount of steam for atomizing. The latter item having been reduced from 4.28% of the total steam generated to 3.37%. These efficiencies are only comparative as a heat balance shows that the efficiency is probably higher in each case than that given. The discrepancy is due probably to an error in the oil meter.



Arrangement of baffles between gas passages before making the changes for the test—Fig. 4

A comparison of the tests at other ratings shows a marked improvement in the operation of the boiler, particularly in the amount of steam for atomizing the oil. Subsequent to the tests enumerated it has been found that rating could be obtained on the boiler if the steam for atomizing was supplied through only a 1/4 in. hole in the disc previously mentioned. Under this condition the steam for atomizing was reduced to slightly above 2%.



Arrangement of baffles between gas passages after making the changes for the test—Fig. 5



Checkerwork and housings installed around burners—Fig. 7

ITEM NO.	DATE	1915	APRIL 19	APRIL 19	APRIL 20	APRIL 20	APRIL 20	MAY 10	MAY 11	MAY 12	MAY 14
			2-4 PM	7-7:45 PM	10:20-11:00 AM	3:20-4:20 PM	3-4 PM	2:00-4:00 PM	2:45-4:45 PM	2:15-3:15 PM	7:45-8:45 AM
1	DURATION OF TEST	HOURS	2	3/4	1 1/2	1	1	2	2	2	1
2	AIR SPACE IN GRATE	SQ. FT.	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1	SEE SKETCH NO. 1
3	OIL BURNERS	NO. & MAKE	3	3	3	3	3	3	3	3	3
4	BAROMETER	INS. MERCURY	196	197	197	196	196	198	202	197.6	199
5	STEAM GAUGE (SATURATED)	LBS.									
6	STEAM GAUGE (SUPERHEATED)	LBS.									
7	STEAM PRESSURE AT BURNER	LBS.									
8	OIL PRESSURE AT BURNER	LBS.									
9	OIL PRESSURE ON LINE	LBS.	52	57	52	52	52	52	52	52	55
10	DRAFT UNDER GRATE	INS. WATER	.10	.07	.107	.069	.078	.055	.046	.075	.103
11	DRAFT IN FURNACE	INS. WATER	.096	.065	.103	.074	.083	.026	.017	.055	.076
12	DRAFT IN TOP OF 1ST PASS	INS. WATER	.03	.00	.035	.00	.016	+.025	+.034	.00	.042
13	DRAFT BEFORE DAMPER TOP OF 3RD PASS	INS. WATER	.19	.176	.195	.18	.21	.095	.055	.163	.271
14	DRAFT AFTER DAMPER	INS. WATER	.205	.20	.204	.194	.225	.177	.19	.181	.315
15	BOILER ROOM	DEGREES F.	205	200	196	200	187	181	190	184	200
16	FEED WATER	DEGREES F.									
17	SUPERHEATED STEAM	DEGREES F.									
18	SATURATED STEAM	DEGREES F.	386	387	387	386	386				
19	DEGREE OF SUPERHEAT	DEGREES F.	0	0	0	0	0				
20	FURNACE	DEGREES F.									
21	ESCAPING GASES	DEGREES F.	565	603	542	574	610	504	483	566	642
22	FUEL OIL TO BURNERS	DEGREES F.	181	183	182	170	177	176	177	179	180
23	TOTAL FUEL OIL USED	LBS.				1720	1970	3260	2836	4100	2300
24	GRAVITY OF FUEL OIL	DEGREES B.									
25	PER CENT OF WATER IN FUEL OIL										
26	HEATING VALUE OF FUEL OIL	B. T. U. PER LB.	ASSUMED			18500	18500	18500	18500	18500	18500
27	TOTAL FUEL OIL USED FREE FROM WATER	LBS.									
28	FUEL OIL PER HOUR AS FIRED	LBS.				1720	1970	1630	1418	2050	2300
29	FUEL OIL PER HOUR FREE FROM WATER	LBS.									
30	TOTAL WATER USED	LBS.									
31	FACTOR OF EVAPORATION		1.053	1.06	1.062	1.06	1.07	1.08	1.065	1.08	1.06
32	TOTAL WATER EVAPORATED FROM & AT 212° F.	LBS.				22710	24340	20280	17300	26010	31600
33	ACTUAL WATER EVAPORATED PER HOUR	LBS.	18960	20500	20600	24070	26050	21900	18420	28100	33490
34	WATER EVAPORATED PER HOUR FROM & AT 212° F.	LBS.	19960	21730	21880						
35	WATER EVAPORATED PER L.B. OF OIL AS FIRED	LBS.				13.2	12.33	12.44	12.2	12.7	13.72
36	WATER EVAPORATED FROM & AT 212° F. PER L.B. OF OIL AS FIRED	LBS.				14.0	13.20	13.44	13.0	13.7	14.55
37	Water Evaporated from & at 212° F. per Lb. of Oil Free from Water	Lbs.									
38	PER CENT OF TOTAL STEAM USED BY BURNERS	%	4.4	5.17	4.04	3.75	4.28	3.15	3.06	3.12	3.37
39	GROSS EFFICIENCY	%				73.7	69.5	70.5	68.1	71.9	76.4
40	NET EFFICIENCY (DEDUCTING STEAM USED BY BURNERS)	%				71.0	66.5	68.3	66.02	69.3	73.82
41	STANDARD COMMERCIAL HORSEPOWER DEVELOPED	H. P.	580	630	635	700	755	635	528	815	972
42	BUILDERS' RATING	H. P.	524	524	524	524	524	524	524	524	524
43	PER CENT HORSEPOWER DEVELOPED OF RATING	%	111	120	121	134	144	121	101	156	186
44	CARBON DIOXIDE	TOP OF 1ST PASS CO ₂ VOLUME IN %	15.0	15.6	14.8	15.4	15.0	15.190	14.5	15.6	14.9
45	OXYGEN	" " " " O VOLUME IN %	0.2	0.5	0.1	0.8	0.2	1.3	2.0	0.5	0.0
46	CARBON MONOXIDE	" " " " CO VOLUME IN %	0.6	0.6	0.6	0.0	0.8	0.1	0.0	0.1	1.3

SPARKS—Current Facts, Figures and Fancy

(A doctor's consultation by wireless, a new motor of small dimensions, a series of experiments on the absorption of heat by colors and various items of war interest in their after-the-war significance.—The Editor.)

An antiquated law in Minnesota makes it possible to raise not more than one mill on the assessed valuation of the state for building roads and bridges. This means that not more than \$1,600,000 can be spent in that state for road work during 1919—for the state constitution further prohibits the state from incurring any debt whatsoever for works of internal improvement.

* * *

Among the directions issued by the London Safety First Council for the benefit of pedestrians during the periods of darkness imposed by Zeppelin raids was one to the effect that a white handkerchief should be held out when crossing the road, to attract drivers' attention and to indicate your whereabouts. There is many a dimly lit corner on country roads where this practice might find permanent application.

* * *

The wireless telephone and the wireless telegraph were used in mid-ocean recently by a doctor on one transport to prescribe for patients on another which was many miles away. While the two transports were fifteen miles apart at a point about 500 miles north of the Azores, the wireless telephone was used for a consultation of the doctors on board. Six doctors each put on a telephone set and "attended" the consultation.

* * *

The difficulties of inland transportation in China made it necessary to specially design the parts of three wireless stations to be installed at Kasgar, Urumchi and Lanchow-fu so that the heaviest piece would not exceed 300 lbs. The stations, when completed, will far exceed the power and range of transmission of any other station in China and as a purely commercial telegraph circuit overland will exceed in length any other in the world.

* * *

An electric motor of extremely small dimensions has appeared on the market. It is enclosed in a shell of 3 cm. diameter and 4 cm. length and weighs 150 gm. The shaft is arranged so as to hold tools that are required by dentists and surgeons, but the device should be of great use for other purposes—such as boring small holes in metals and rare stones. The motor can be driven by direct or alternating current, and runs at a maximum speed of 5,000 r.p.m.

* * *

The Western Electric Company's factory in Antwerp is soon to be in running order again, thanks to the foresight of one of the officials who buried the records and valuable papers so skilfully under the floor that the Germans could not locate their

hiding place. Foreseeing that the machinery would be carried off, he procured a list of the equipment and at the time he was forced to leave Antwerp, placed an order for its duplication at the close of the war.

* * *

Feeding the cattle on paper may become common practice. Paper made of leaves was a war measure in France and was so successful that it is likely to be continued as a regular product. The discoverer of this new material claims that it has a number of uses in addition to its use as a paper material. First, it has a high food value, since it contains the digestible parts of the leaves with the cellulose removed. Then it can be used as fuel. Compressed into cakes it may be used either with or without charcoal.

* * *

The shortage of tin was so acute in Germany during the war that as early as January, 1917, an order was issued confiscating all organ pieces made of tin. By this proclamation churches, clubs, hospitals, prisons, universities, concert halls, etc., which possessed organs, as well as makers of organs and dealers—were required to deliver their tin pipes to indicated collecting stations. Exception was made only in the case of articles declared by duly authorized experts to have special intrinsic or historical art value.

* * *

Coblentz saw its first electric Christmas tree on Christmas Eve. It was set up in the plaza along the Rhine, directly in front of the headquarters of the Third Army. The tree, which was 40 ft. high, was decorated with red, white and blue ribbons and was trimmed by army nurses. It was placed in position by members of the Thirty-seventh Engineers. Red, white, and blue incandescent lights covered the tree, at the base of which, in letters 3 ft. high, were the insignia of the Third Army. The electricity was furnished by a portable plant taken to the spot by American troops.

* * *

Experimental temperature observations were made recently at Balboa Heights to determine roughly the comparative heat absorbing properties of various colors exposed to the sun's rays. The red gave readings approximately half way between the white and the black, and a thermometer bulb covered with navy blue bunting gave approximately the same temperature readings as the black. It would seem that the maximum heating of corrugated iron roofing on dwelling houses in the Canal Zone might be reduced approximately 10 degrees Fahrenheit by painting these roofs red instead of black, or reduced 20 degrees Fahrenheit by painting the roofs white.

PERSONALS

Lars R. Jorgensen, a consulting electrical and hydraulic engineer of San Francisco, has been awarded the Norman medal for the year 1918. The medal is each year awarded by the American Society of Civil Engineers for the best paper submitted to the Society during the current year. Mr. Jorgensen's paper was entitled "Multiple-Arch Dams on Rush Creek, California." Readers of the Journal of Electricity are familiar with this excellent work of Mr. Jorgensen as he has during recent months contributed a number of interesting papers

to its columns along the same discussion. Mr. Jorgensen is now under nomination as a vice-president of the American Institute of Electrical Engineers and the best wishes of engineers of the West go with him in his continued rise in the engineering profession.

E. H. Eardley and W. G. Bruce of Eardley Bros., Salt Lake City, are recent San Francisco visitors and later visitors at San Diego.

W. J. Davis, Jr., Pacific Coast engineer for the General Electric Company, with headquarters at San Francisco, has returned to his home office after an extended visit to New York City.

Lee Hagood, an electrical engineer, representative of the General Electric Company at Petrograd, Russia, has recently arrived in America and is stopping at the Mohawk Club, Schenectady, New York.

Manly C. Turpin, assistant to the manager of publicity for the Westinghouse Electric & Manufacturing Company, is making an extended visit on the Pacific Coast visiting manufacturing, industrial and agricultural centers.

E. Zimmerman, with the Pacific Gas & Electric Company until he entered army service, has recently returned and is now on the sales force of the Pacific States Electric Company in San Francisco, specializing on lighting equipment.

Captain Guy Barker, formerly with the distribution department of the Pacific Gas & Electric Company, has returned from France to his home in San Francisco. In the service Mr. Barker was engaged in the Coast Artillery branch.

Chuzo Mori, an electrical engineer in the department of communication of Japan, who has in charge the issuance of water right permits in Japan, is a Pacific Coast visitor and is now visiting many power installations in the southern district of California.

Harold G. Baugh, recently on the electrical engineering staff of the Union Iron Works, and formerly in the distribution department of the Pacific Gas & Electric Company at San Francisco, has moved to Petaluma, where he will be connected with the firm of his brother, known as Bauer and Baugh.

Colonel H. M. Byllesby has been elected president of the Chicago branch of the National Security League, succeeding H. H. Merrick. Colonel Byllesby is scheduled to give the leading talk at the grand banquet of the Pacific Coast Section, N. E. L. A., to be held at Coronado Hotel, California, May 2, 1919.



George H. Hagar, recently a captain in the U. S. Heavy Artillery, is now chief engineer of the Vallejo Electric Light & Power Company. Mr. Hagar is making a change over in the distribution system from 2-phase, 2400 volts to 3-phase, 4000 volts. The company purchases its power from the Pacific Gas & Electric Company.

Charles C. Parlin, manager of commercial research for the Curtis Publishing Company of Philadelphia, is a recent Pacific Coast visitor. While in San Francisco Mr. Parlin gave an interesting talk on electrical commercial research matters before the recent San Francisco dinner of the California Electrical Cooperative Campaign.

Paul Lincoln, commercial engineer for the Westinghouse Electric & Manufacturing Company, with headquarters at East Pittsburgh, is a recent Pacific Coast visitor. Mr. Lincoln is a past president of the American Institute of Electrical Engineers and is in addition to filling a crowded business program, attending a number of western sections of the Institute.

Elgin Stoddard, vice-president of Chas. C. Moore & Company, engineers, has returned to San Francisco from a trip to New York City in time to lead in the activities of the San Francisco Section of A. S. M. E. given in honor of Calvin A. Rice, secretary of the society. Mr. Stoddard is acting chairman of the local section in absence of E. C. Jones of the Pacific Gas & Electric Company, who is confined to his home on account of illness.

E. R. Hessling and C. H. R. Arntzenius, Dutch telephone experts, are in this country on a transcontinental trip to investigate American telephone systems. They are strong advocates of the automatic telephone which obtains extensively in Holland. They state the Hague, with 400,000 population, has but 12,000 telephones, while Salt Lake City, Utah, with 125,000 population, has 25,000. The Dutch government is acquiring all the telephone systems in Holland.

C. M. Gifford, the newly appointed Pacific Coast manager of the H. W. McCandless & Company, with headquarters in San Francisco, comes to his new position with long acquaintance in matters electrical. Back in the busy days of the Panama Canal excavation he was in Y. M. C. A. work and had close association with General Goethals in connection with those endeavors. For the past four years he has been closely engaged in various departments of the lamp company of which he is now Pacific Coast manager. Though but a novice of four



months in golfing, Mr. Gifford's former wide experience in athletics has enabled him to progress unusually rapidly. At the recent Del Monte meeting of Electrical Jobbers his score was 96, while upon the California Course in San Francisco on Washington's Birthday the San Francisco Chronicle had the following to say: "In sweepstakes competition at the California Golf Club the winner was C. M. Gifford. Gifford turned in a card of 93. That, less his handicap of 22, gave him a 71 for the course. The three winners out of 25 entries:

	Gross	Hdcp.	Net
C. N. Gifford.....	93	22	71
W. F. Stewart	84	10	74
Ben Golcher	85	10	75
Geoffrey Almy	96	16	80
Ernest Munton	98	17	81
F. D. Atherton	92	12	80
A. L. Speetzen	87	10	77
R. B. Woolcot	99	20	79
G. K. Fish	98	16	82
W. D. McNicoll	90	12	78
C. D. Rand	101	20	81

Calvin A. Rice, secretary of the American Society of Mechanical Engineers, with headquarters in New York City, has passed on through Los Angeles and San Francisco to the business centers of the northwest. While in California Mr. Rice's presence has proven unusually helpful. Not only have the interests of his own society been forwarded by the broad way in which he has assisted in the solution of a very delicate professional problem in the West but his presence here has also been helpful in aiding engineers as a body in seeing the

greater service ahead in which engineers may prove of vital assistance in discussing and solving present-day problems before the citizenship at large.

G. L. Oman, northwestern manager of the Pacific States Electric Company, has been a recent Seattle visitor.

F. E. Johnson, Jr., vice-president of the M. W. Kellogg Company of Jersey City, is a recent San Francisco visitor.

H. A. Joslin, manager of the Dallas, Ore., division of the Mountain States Power Company, has been reelected vice-president of the Dallas Chamber of Commerce.

Baron Shimpei Goto, former Minister of Communications of Japan, accompanied by his son, a Columbia University student, and party, arrived in San Francisco recently from the Orient.

W. H. Whiteside, who has for many years past been connected with the Westinghouse Electric & Manufacturing Company in the capacity of a vice-president, is a recent San Francisco visitor.

W. G. Swendsen, formerly of Pocatello, who has done the engineering work for the Idaho public utilities commission, has recently been appointed state engineer of Idaho to succeed F. A. Wilkie.

J. G. De Remer, a consulting engineer of New York City, formerly with the United Light & Power Company of San Francisco, has opened consulting engineering offices in the Rialto Building in San Francisco.

Oscar G. Goldman, formerly first lieutenant in the water supply division of the U. S. Army, is back from France and again in his work with the engineering staff of the Spring Valley Water Company in San Francisco.

C. B. Merrick, field representative of the Journal of Electricity, has returned to San Francisco after an absence of nearly three months, in which time he visited practically all electrical centers throughout the northwest inter-mountain districts.

Capt. Chas. Grunsky, formerly connected on valuation work with the California Railroad Commission and now captain of engineers with the 5th Engineers, has recently returned from France and is visiting the Pacific Coast on leave, his regiment being stationed in Virginia.

J. W. Oberender, who for some years has acted on part time as the efficient secretary of the Oregon Association of Contractors and Dealers, has recently been employed by that organization to give his entire time to the work. The Association has also fitted up new offices in the McKay Building, Portland, and looks forward to greatly increased effectiveness within the next few months.

Milton Kraemer, a consulting engineer of San Francisco, who during the war period was in the service of the Federal Fuel Administration in the capacity of combustion engineer, has established the Unit Engineering Company in San Francisco to undertake problems of power efficiency. He has recently published a copyrighted pamphlet on the sub-

ject of superheaters and superheating that should prove helpful to those engaged in steam power generation.

Guy C. Pierce, recently affiliated with R. C. Gillis in water power interests in Los Angeles, has accepted the position of vice-president and general manager of the Northwestern Electric Company to succeed W. E. Coman, who recently resigned to occupy a similar position with the Washington Power Company at Spokane. Mr. Pierce has a long experience to fit him for the post. Beginning in Sacramento in 1887 he went to San Francisco, where later he was general manager of the Edison Company. More recently he had been connected with hydroelectric development on the Pacific Coast.

Y. Matsunaga, M. P., Tokyo, Japan, president Hakata Chamber of Commerce; Masayuki Naruse, Tokyo, Japan, president, Seiko & Company; and Ryomin Inouye, M. A. (Yale), of Tokyo, Japan, passed through San Francisco and Los Angeles recently on their way East enroute to Europe. Mr. Matsunaga, besides his activities in political affairs, is the managing director of the Kyushu Electric Light & Traction Company, which system operates quite extensively in the southern part of Japan. Mr. Naruse is also interested with Mr. Matsunaga in the same company. It is understood that Mr. Inouye is acting as private secretary to Mr. Matsunaga.

George G. Anderson and Wilfred Barnard, two consulting engineers of Los Angeles representing the Joint Engineering Council in the Los Angeles district, made a visit to San Francisco recently at the invitation of the Joint Engineering Council of San Francisco, in order to discuss the engineers' license bill up before the California legislature. The meeting in San Francisco was well-attended and after prolonged discussion it was decided to withdraw the bill. It is believed that a great good has resulted in that engineers the state over have come to a working understanding in the matter and that a most cordial feeling will exist in all future consideration of the subject.

Personals of Trade Interest

Paul A. Shilton, Los Angeles representative of R. J. Davis, District Sales Agent for Century A.C. Motors and Fans, is visiting the dealers in Arizona.

R. M. Cole, formerly with Thompson & Castleton, electrical engineers of Seattle, is now with the Seattle office of the Economy Fuse Manufacturing Company.

George K. Heyer is the new assistant telephone sales manager of the Western Electric Company, having been advanced from the position of railway sales engineer.

A. H. Kahn, general purchasing agent for the Pacific States Electric Company with headquarters at San Francisco, recently visited the Seattle and other northwestern houses of the company.

Mailler Searles, western representative of manufacturers of merchandizing-handling equipment, including electric industrial trucks, has moved his offices from the Monadnock Building to the Rialto Building, San Francisco.

E. V. Adams succeeds G. K. Heyer as railway sales engineer of the Western Electric Company. Mr. Adams was formerly stationed in the West and Middle West, but in 1913 went to New York where his headquarters will remain.

C. R. Hunt, of Robbins & Myers, with headquarters in San Francisco, is leaving for a trip through Utah, Idaho, Washington and Oregon. He expects to meet at Salt Lake City W. W. Mumma, sales manager of his company, and both will attend the big convention at Coronado, April 30-May 2, 1919.

Joseph L. Jaffe, secretary and sales manager of the Perfeclite Company, Seattle, recently returned from California after placing agencies and has departed for New York and other eastern cities in connection with the rapid expansion of the Perfeclite lighting fixture business. He will place agencies in a number of the larger eastern cities.



MEETING NOTICES FOR ELECTRICAL MEN

(Meetings of especial interest are reported from the local centers during the past two weeks period. Convention plans for the Vancouver meetings of May 26 and 27 and the big Coronado Convention of April 28 to May 2 are well in hand—and representative gatherings are expected at each.—The Editor.)

The San Francisco Dinner of the California Electrical Cooperative Campaign

Attended by a notable gathering of men, the dinner of the California Electrical Cooperative Campaign, which was held at the San Francisco Commercial Club rooms Thursday evening, March 13, 1919, proved an unqualified success. Nearly three hundred and fifty seats by actual count were found to be occupied during the evening, which number far exceeded the fondest expectations of those having the affair in charge.

The keynote of the evening was struck by Chas. C. Parlin, manager of commercial research for the Curtis Publishing Company, when as an advertising man interested in effective advertising, he emphasized the necessity of local men tying-in with national advertising to accomplish the best results.

In detail the program for the evening was as follows:

Samuel Kahn, President—"Pacific Coast Section N. E. L. A."
G. E. Arbogast—"The Cooperative Campaign."

C. N. Banta, Wells Fargo Nevada National Bank—"How Cooperation Affects Credits, Collections and Finances."

Chas. C. Parlin, Manager Division of Commercial Research, Curtis Publishing Co.—"Market Opportunities of Electrical Distributors."

At the speakers' table were: A. W. Childs, assistant general agent of the Southern California Edison Company and chairman of the commercial committee of the Pacific Coast Section N. E. L. A.; C. N. Banta, Wells Fargo Nevada National Bank, San Francisco; G. E. Arbogast, vice-president California Association of Electrical Contractors and Dealers; Chas. C. Parlin, manager commercial research, Curtis Publishing Company; L. H. Newbert, manager commercial department, Pacific Gas and Electric Company, and chairman advisory committee, California Electrical Cooperative Campaign; Samuel H. Kahn, manager Western States Gas & Electric Company and president Pacific Coast Section N. E. L. A.; R. S. M. Boyce, local manager Curtis Publishing Company; W. S. Berry, western sales-manager Western Electric Company, and K. E. Van Kuran, Los Angeles manager Westinghouse Electric & Manufacturing Company. Great credit is due Leon Van Atta of the Pacific States Electric Company and F. E. Boyd of the General Electric Company, who acted as chairman and treasurer, respectively, of a Boosters' Committee formed just a week prior to the event to make the meeting a success.

C. N. Banta of the Wells Fargo Nevada National Bank opened up new ideals of helpfulness in cooperative effort and showed in a most convincing manner how cooperation very materially affects credits, collections and finances of every branch of the industry.

Chas. C. Parlin, of the Curtis Publishing Company, gave a most interesting lecture setting forth the splendid part the electrical industry will play in years immediately ahead. In conclusion he most emphatically brought out the truth that while advertising prepares a field that should stimulate work in an industry, it is only by the cooperative effort of all concerned that the highest and best results may be obtained.

Thus closed one of the most notable and helpful dinners thus far undertaken by the California Electrical Cooperative Campaign.

Oregon Association of Electrical Contractors and Dealers

Several matters of importance have come up at recent

meetings of the Portland local branch of the Oregon Association of Electrical Contractors and Dealers. The question of dues was considered at the meeting of Feb. 24th and finally fixed at the next meeting, dues hereafter to be retroactive as of Jan. 1, 1919, as follows: Class A members, \$7.50 per month, Class B members, \$10 per month, Class C members, \$12.50 per month, Class D members, \$20 per month, Class E members, \$30 per month, to be payable either monthly or quarterly, in advance.

A financial report showing income and expenditures with a balance of \$696.57 was presented and accepted. The association heard a report on the Own Your Own Home Bureau and the matter of submitting estimates of costs for the use of the Bureau and determined upon cooperation with this organization.

Mr. Larsen reported attending a meeting at the fire marshal's office in reference to the installation of fire alarm systems and reported that it was the sense of the meeting that some specifications covering this work were needed, as the inspectors were finding many installations not installed properly. A committee was appointed with F. A. Bauman, chairman, who reported at the next meeting, making recommendations of specifications for the installation of fire gongs which were adopted with slight changes.

At the March 10th meeting it was decided on the recommendation of the State of the Association committee to retain the secretary at full time and furnish necessary office equipment and help, with a view to increasing the value of the society to its membership. This plan is to be given a three months' trial.

Vancouver Convention

Plans for the May 26th and 27th convention of the Vancouver Association of Electrical Contractors and Dealers are fast taking shape and a large attendance is expected. The

BUILDERS OF THE WEST—L.



FRANKLIN K. LANE

Seldom in the arena of human affairs do we witness a public servant act with the wisdom, with the devotion, with the consecrated idealism, such as instanced time and again by Franklin K. Lane, Secretary of the Interior. As a product of the West, devoted to the development of the native values of our great nation, he has few equals. This issue of the Journal of Electricity is affectionately dedicated to Franklin K. Lane, as a lasting memorial to his kindly and loving service in a public life well worthy of emulation.

following names are among the preliminary list of those who are being urged to attend. All those interested in electrical matters on the Pacific Coast are cordially invited to this gathering.

Sam Pugh, Chilliwack, B. C.
W. S. Robinson, Duncan, B. C.
W. K. Manley, Grand Forks, B. C.
Miller & Gradner, Grand Forks, B. C.
Marsh Bros., Kamloops, B. C.
J. E. Trenwith, Kelowna, B. C.
Taylor Electric Co., Ladner, B. C.
C. F. Bryant, Nanaimo, B. C.
W. H. Morton, Nanaimo, B. C.
J. H. Matheson, Nelson, B. C.
Penticton Electric Co., Penticton, B. C.
Mattie & Handforth, Prince George, B. C.
Parkin & Ward, Prince Rupert, B. C.
F. N. MacDonald, Princeton, B. C.
Prince Rupert Engineering Company, Prince Rupert, B. C.
T. P. Thorner, Summerland, B. C.
J. M. Edgar, Vernon, B. C.
F. J. Evans (V. I. F. Lands), Vernon, B. C.
T. C. Duncan, Elec. Supt., Prince Rupert, B. C.

H. A. Carney, City Clerk, Prince George, B. C.
H. A. Morrison, City Clerk, Ladysmith, B. C.
H. A. Garrard, Elec. Supt., Duncan, B. C.
A. S. Fraser, Elec. Supt., Kamloops, B. C.
W. E. Dickey, Elec. Supt., Revelstoke, B. C.
G. A. McNaughton, Elec. Supt., Armstrong, B. C.
H. A. Blakeborough, Elec. Supt., Vernon, B. C.
G. H. Dunn, City Clerk, Kelowna, B. C.
F. S. McKeever, Elec. Supt., Penticton, B. C.
R. F. Blandy, City Clerk, Port Alberni, B. C.
J. Shortt, Mgr. Cumberland Light Co., Cumberland, B. C.
C. S. Wood, Mgr. Lighting Dept., Courtenay, B. C.
W. Lewis, Mgr. Nanaimo Electric Light Co., Nanaimo, B. C.
C. L. Wain, Elec. Contr., Kamloops, B. C.
H. P. Thomas, City Clerk, Electrician, Kamloops, B. C.

Coronado Conventions

With the Coronado conventions of the N. E. L. A., Pacific Division Electrical Supply Jobbers' Association and the California Association of Electrical Contractors and Dealers less than a month off, definite plans for attending



On the piazza at the Coronado

the convention are already being made. A large delegation from the San Francisco region is expected and arrangements for transportation have been made to meet every one's convenience. The S. S. "Governor" or the S. S. "President" will leave Pier No. 18, foot of Howard street, San Francisco, at 12 noon, Monday, April 28th, and arrive at Wilmington at 12 noon, Tuesday, remaining there until 10:30 a.m. Wednesday, when it will sail for San Diego, arriving at 4:30 p.m. Wednesday. As this steamer reaches San Diego too late to permit of attendance at the opening meeting of the convention scheduled for Wednesday afternoon, it is recommended that delegates leave the boat at Wilmington and take the train to Los Angeles and from there to San Diego, arriving at 9:30 p.m. Tuesday.

No special rates are permitted on the railroad, owing to heavy traffic in connection with the demobilization of troops, and no reservations of Pullman space can be made. That is, it is advisable to purchase both tickets and Pullman space at the earliest possible moment.

Many members are planning to make the trip by automobile and special features of interest are planned as part of the trip. A limited number of automobiles may be carried

on the boat if arrangements are made in time. Anyone wishing further information should communicate with the Master of Transportation, W. M. Deming, Gen'l Mgr., Journal of Electricity.

The schedule of papers is now definite as given below. These papers will appear in full in the next issue of the Journal of Electricity.

Engineering Committee Papers—

"Use of Pulverized Coal from the California Coal Fields," by Chas. H. Delany.
"The Emergency Interchange of Power," by G. R. Kenny.
"San Joaquin Induction Generator Plants," by E. A. Quinn.
"Relay Protection Systems," by G. E. Armstrong.
"Converting a Steam Plant to Stand-by Operation," by L. M. Klauber.
"Increasing the Revenue by the Use of a Straight Line Watthour Meter," by Otto A. Knopp.
"The Electric Welding Load," by John Hood.
"Kilowatt Hours per Barrels of Oil," by S. J. Lisberger.
Report of the Insulator Committee, by J. A. Koontz.

Commercial Committee Reports—

"Selling the Idea," by H. L. Harper.
"The Contractor-Dealer of Tomorrow," by John C. Rendler.
"Progress of Electric Cooking and Heating," by Ben M. Maddox.
"The Proper Training of the Sales Personnel," by Lee H. Newbert.
"How Can the Electrical Industry Assist the Architect in Serving His Clients?" by J. O. Case.
"Appliance Sales Policies," by T. W. Simpson.

Journal of Electricity Endorsed at Portland Joint Meeting

The regular monthly meeting of the Portland Section of the N. E. L. A. and A. I. E. E. was held on Feb. 4, 1919. Chairman Boykin of the A. I. E. E. had charge of the meeting and announced that Major Zinn of the U. S. Engineers would present a paper at the March meeting of the Associations, and that the United States representative inspecting concrete hulls would present a paper at the April meeting describing the method of constructing these hulls as carried on at the concrete shipyard located at Vancouver, Washington. Announcement was also made of the decision of the two associations to assist in increasing the subscribers to the Journal of Electricity, which is the western representative of this line of publications and which deserves support from the engineers of the West. A special inducement was offered to anyone who wished to subscribe to this journal through the secretary of the association. Announcement was also made of a special rate for local membership in the joint associations, together with a year's subscription to the Journal of Electricity. Following these preliminary announcements the speaker of the evening was introduced.

Mr. H. J. Shepard, from the Seattle office of the Pacific Telephone and Telegraph Company, described in a very entertaining manner the laying of about 18,000 feet of submarine telephone cable across an arm of Puget Sound. This is a portion of a telephone connection between Seattle and Bremerton which constitutes about a 15-mile line, 5 miles of which are submarine. The cable described in the paper forms approximately .6 of this total submarine distance and is laid marine telephone cable across an arm of Puget Sound. Details of the talk will be given in the next issue of the Journal of Electricity.

The speaker showed the principal features of this work by means of lantern slides during his talk and followed by illustrating still further by means of a moving picture film taken during the actual operation of laying the cable. This was a very entertaining and instructive meeting to all who were fortunate enough to attend. There were 55 present.

The meeting was held in the Library Hall at 10th and Yamhill streets and the entertainment committee provided the audience with fine Hood River apples following the lively discussion of the paper.

American Welding Society

After a preliminary meeting for organization purposes, the American Welding Society formally held its first meeting on Friday, March 28, 1919, at the Engineering Societies Bldg., New York.

It is the purpose of the society to become a disinterested and dependable source of information on welding, not only

for the benefit of the manufacturers of welding apparatus and supplies, but also to aid those who use welding in their production and those who purchase welded goods. All those interested in welding are eligible to join and if they will send in their names to the Journal of Electricity or to F. A. Anderson of the U. S. Shipping Board of San Francisco, they will be put in touch with the new organization.

Electrical Supply Jobbers

Interesting meetings were held during March by the Central and Atlantic Divisions of the Electrical Supply Jobbers' Association. Of particular interest was the discussion which developed at the Chicago meeting in reference to carrying expense of salesmen, stenographers and typists, operating expenses and overhead. The need of establishing similar figures of a concrete nature to serve as a basis for studying economies of distribution was brought out. These are to be secured and will be a feature of the summer convention during June.

W. R. Herstein of the Electric Supply Company of Memphis, Tenn., was elected chairman of the Central Division.

New Mexico Convention

A most successful convention was held by the New Mexico Electrical Association at Albuquerque during February. Among the papers were:—

"Industrial Lighting"—by W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company.

"Relations of Consulting Engineer to Public Utilities"—by H. O. Duerr, consulting engineer of Albuquerque.

"Efficiency"—by M. R. Buchanan, manager of the Silver City Power and Ice Company.

"Some Considerations in the Use of Iron Wire for Alternating Current Transmission"—by Prof. R. W. Goddard of the New Mexico College of Agriculture and Mechanical Arts.

"High Voltage Pin Type Insulators"—by H. L. Garbutt, manager of the line material section of the Westinghouse Electric & Manufacturing Company of East Pittsburgh.

"Power Factor"—by B. C. J. Wheatlake of the General Electric Company, Denver, Col.

"Prospects for the Year 1919"—by W. P. Southard, manager of the Trinidad Electric Transmission Railway & Gas Company, Trinidad, Col.

"Marketing Condition of Materials Used Principally in Central Stations"—by A. C. Cornell, sales manager of the Western Electric Company of Denver.

"The Relation of the Manufacturer to the Utilities"—by C. D. LeMoree, Westinghouse Electric & Manufacturing Company of Los Angeles, Cal.

"Electrical Merchandising"—by D. W. Morgan, manager of the Las Cruces Light & Power Company.

"What the Electrical Association Means to Its Members"—by M. E. De France, manager of the Deming Ice & Electric Company.

"Knowledge that Pays Dividends"—by J. D. Clark, professor of chemistry at the University of New Mexico.

WESTERN MEETINGS

A. I. E. E., Seattle Section —

March 29.—John B. Fiske—"The Engineer, His Opportunities and His Duties"; Paul M. Lincoln—"The History of Electric Power Transmission."

A. I. E. E., Spokane Section —

March 21.—C. D. Dolman, chief chemist Northwest Magnesite Co., Chewelah—"Magnesite, Its Geology, Products and Their Uses."

A. I. E. E., San Francisco Section —

March 28.—W. F. Dietrich—"Mountain Railroad Electrification in California." Extracts from Mr. Dietrich's report were published in the Journal of Electricity several months ago and members were therefore familiar with the proposition and ready to enter into discussion.

Associated Engineering Societies and the Engineer's Club, Seattle —

March 22.—Geo. F. Nicholson, chief engineer of the port of Seattle—"Port of Seattle Problems" and motion pictures of "Seaboard Coaling Stations Along the Atlantic Coast."

Oregon Society of Engineers —

March 21.—Special entertainment meeting for architects and engineers. Discussion of the compensation of engineers.

Engineers' Club of San Francisco —

March 21.—Lieut. Chas. F. Roth—"Development of Industry by Chemical Engineering" and the Influence of the Annual National Exposition of Chemical Industries.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section —

March 27.—Lieut. Col. A. H. Griswold—"Signal Corps Work with the American Expeditionary Forces."

American Chemical Society—California Section —

March 14.—Capt. W. E. Brophy, C. W. S., U. S. A.,—"Gas Defense Chemicals."

Pacific Service Employes' Association —

March 11.—Capt. W. E. Brophy—"Production of Charcoal at Potrero Gas Plant for War Defense Service"; Robt. Eltringham—"Proposed Master Electrician's Law"; Non-listing Adding Machine Contest—Accuracy and Speed.

Los Angeles Jovian Electric League —

March 19.—Col. Samuel Rees—"War and Home Service of the Salvation Army."

March 26.—R. T. Burge—"What to Do with the Bolshevik"; Congressman H. Z. Osborne—"The Reconstruction Problem."

San Francisco Electrical Development League —

March 17.—Charles Victor, Pacific Coast manager Yawman & Erbe—"Personal Side of Scientific Salesmanship."

March 24.—J. D. Fenstermacher, sales manager Columbia Steel Company—"Making Steel Electrically," illustrated by moving pictures.

HAPPENINGS IN THE INDUSTRY

TRADE NOTES

San Joaquin Valley Notes —

The Bright Spot Electric Company has recently entered the field at Stockton. W. A. Murphy and G. A. Marengo are the proprietors.

Gould the Light Man at Stockton has just moved into a finely equipped new store in the shopping district in Stockton.

The Sullivan Electric Company of Modesto have recently opened for business in an attractively equipped store.

The Los Banos Electric Shop has recently been opened. R. G. Murphy is the proprietor.

The Star Electric Company at Bakersfield has recently moved from East Bakersfield into a very attractive location in Bakersfield proper.

The E. M. M. Service at Lindsay has under construction a new building which will give them one of the finest electrical establishments in the state. They expect to occupy it within thirty days.

Lawrence Scott, formerly with the Mt. Whitney Power Company, has recently bought a half interest in the Chaffee Electric Company at Visalia.

E. B. Anderson of Coalinga has just moved into a fine retail establishment, and is opening a fully equipped retailing business.

Henry Fenneman of the United Electric Company, at Taft, was a recent visitor to San Francisco.

The Central States Electric Company at Fresno have recently expanded their place of business, taking in the store next door, which will be devoted to the selling of washing machines and vacuum cleaners.

Incorporation —

The firm of Woods, Huddart & Gunn has been incorporated under the new name of Gunn, Carle & Co. The business will be conducted as heretofore, but on a broader scale. In addition to iron and steel products they are prepared to furnish electric furnaces, cranes, industrial trucks, plant equipment and supplies.

Western Representatives —

Bittman & Battee, Inc., manufacturers' agents, 84 Second street, San Francisco, have been appointed representatives of the Hazard Manufacturing Company of Wilkes Barre, Pa., manufacturers of steel and wire rope, electric wires and cables, etc.

Bond Issue —

The Railroad Commission of California, which exercises jurisdiction over capital issues in this state, has authorized the sale of a block of Western States Gas & Electric Company 5% bonds, due 1941. A number of Pacific Coast dealers, as well as Montgomery & Company of Philadelphia, are associated with the bond department of H. M. Byllesby & Company in selling the bonds at 89½ and interest to yield 5.80%.

A Catalog File —

The Purchasing Agents' Association of Northern California, with headquarters at San Francisco, is starting, for the benefit of its members, a general catalog file. The association through its secretary, Mr. D. B. Gray, 230 California street, San Francisco, invites manufacturers and dealers generally to send complete sets of their latest catalogs and trade publications to the above address. Catalogs covering particularly machinery, mechanical goods, hardware, iron and steel products, etc., are especially requested. This association has over one hundred members located in San Francisco, Oakland and other cities in Northern California, who represent an annual purchasing power of nearly \$100,000,000.

University Extension Course —

The University of California Extension Division is offering "Business Law for Engineers," an evening lecture course, to begin Thursday, April 10, at the San Francisco Public Library. The series will include thirty lectures by Mr. Eugene G. McCann, a member of the California bar, who has had seven years' experience in engineering work in this state. Following are several of the topics to be discussed:

Evidence, Contracts, Torts, Equity, Real Property, Corporations, Agency, Sales, Negotiable Instruments, Railroads and Common Carriers, The Engineer's Legal Relations with Others, Contract Letting, Contract Forms.

The lectures will be given every Thursday evening in the lecture room of the library, which is located at the corner of Larkin and McAllister streets. There is no admission charge for the initial lecture at 8 p.m., April 10th.

CIVIL SERVICE EXAMINATIONS

U. S. Civil Service examinations for the positions of Junior Inspector of Radio Apparatus, Junior Inspector of Telephone Equipment, and Junior Inspector of Telegraph Equipment, are to be held on April 15th. Salaries range from \$1200 to \$1500 per year and the competition is based upon physical ability, education, training, experience and fitness.

PROPOSED LEGISLATION IN OREGON

BY GEO. L. MYERS

The Thirtieth Session of the Oregon legislature adjourned on February 27. No legislation of a detrimental nature to public utilities was enacted, and the session was constructive in its results. However, some legislation was proposed that would have been adverse to the industry had it succeeded in being enacted.

House Joint Resolution No. 19 was the most vicious measure proposed. It provided for the creation of hydroelec-

tric districts throughout the state and made it possible to bond to the extent of two per cent of the assessed valuation of all property in the state; the districts could bond to the extent of five per cent and municipalities within the districts to a like percentage. Had the resolution passed and met the approval of the people and become a part of the constitution, existing investments in public utility properties would have been put in jeopardy with the prospect of unfair competition and capital prevented from making further investments in hydro-electric development. The resolution was finally withdrawn.

Senate bill No. 4 provided for an amendment to the public utility statute to make it impossible for the Public Service Commission to change or modify any rate previously fixed by contract between a municipality and a public service corporation prior to November 7, 1912, when the public utility act was approved by vote of the people. This would have impaired the power of the commission in fixing reasonable rates and would have been contrary to the theory and practice of modern regulation vesting full powers of control as to service and rates in state authorities. An interesting legal question became involved in consideration of this bill, and that was as to whether the commission possessed the power to lower rates fixed by franchise. It was conclusively shown by able argument in committee and on the floor of the Senate that the commission did possess this power, because the state never had by special legislative act divested itself of the sovereign power to regulate public utility rates up or down. Although the bill was favorably reported by a senate committee it failed to pass by a vote of 21 to 9.

Senate bill No. 288 amended the present statute regarding powers of ports to provide that they can develop power for their own purposes. As finally enacted it protects public utilities from competition, inasmuch as the ports are restricted to the development of power for the operation of port facilities only and cannot engage in the business on a commercial scale.

Several house bills were introduced, but failed of passage, with reference to taxation of public service corporations. These bills attempted to make the book value or value ascertained by the Public Service Commission the basis for purposes of taxation, rather than continue the prevailing method of capitalizing the earning power and making the commercial or going value the value for assessing taxes.

A proposed constitutional amendment to make the workmen's compensation act compulsory failed to pass. Several attempts were made to amend the workmen's compensation act by placing additional burdens upon the employer and subjecting him to greater possibilities of personal injury suits, but without success. The act has been amended, however, to make it possible on July 1, 1920, for the commission to regulate rate schedules for contributions to the fund, such rates to be based upon the hazard and experience involved in each industry. This is desirable and more fair rather than to continue the existing practice of schedules fixed by statute.

SAFETY FACTORS IN MULTIPLE ARCH DAMS

A Letter to the Editor

Editor Journal of Electricity,—

Dear Sir: In your issue of March 15, 1919, you published an article entitled "Recent Multiple Arch Dams" by John S. Eastwood, wherein he describes four multiple arch dams he recently completed in San Diego county. Of these the Lake Hodges dam and the San Dieguito dam are most interesting to me inasmuch as Mr. Eastwood appears to claim, on page 265, line 25 from below, that his designs—for the Lake Hodges dam, at least—were accepted in competition with two other types.

As I was one of the competitors, I wish in the interest of fair play to ask Mr. Eastwood to at least make a further statement making it plain, that the designs he sent to the contractors for competitive bidding were very different from the design the structures shown in the pictures were actually built from. Either a note to that effect, or else publish his drawing No. 3 and the elevation on drawing No. 1, which were the principal drawings sent to the contractors.

I am perfectly willing to admit that I lost in competing with that design, but I most emphatically object to being told in a technical journal, that the Lake Hodges dam, as built, was won in a competition. I believe the owners know too, now.

Fortunately, the State Engineering Department interfered and compelled a safe design.

As for my own design—should anybody be interested—it can be found published in the Proceedings of the Am. Soc. of Civil Eng. for May, 1918, page 613, where it is used as an illustration for a paper entitled "Arch Action in Arch Dams." This structure is a single arch 6 ft. thick at the crest and 33 ft. thick at the bottom (127 ft. water pressure), provided with two gravity tangents at the ends to be used as spillways for ordinary floods. For max. floods the arch was to act as a weir also.

Although very little information is given in the article, it is plainly noticeable that two features I objected to at the time of competition have been eliminated in the construction design, namely, the down stream over-

flow deck and a girder near the top of the dam onto which the arches butted in order to make an overflow weir (shown on dr. No. 3 if published).

The down stream overflow deck consisted of a slab 9 inches thick, 24 ft. center to center span reinforced with 1/2 in. sq. steel spaced 12 in. both ways.

A slab 9 in. thick with a span of 24 ft. will hardly support its own weight, besides there is not enough steel (1/2 in. sq. spaced 12 inches) to take care of the temperature stresses alone in a longitudinal direction, the canyon being about 600 ft. wide at the top, and no contraction joints provided. During max. flood this slab must stand the load due to a 12 ft. overflow on the crest. Towards the bottom the sheet of falling water becomes thinner, of course, but the load becomes intensely "live."

The girder near the top of the dam (drawing No. 3 if published) appears to be 15 in. thick and to be reinforced with two rows of 1/2 in. sq. steel spaced 12 in. centers. At an elevation about 6 ft. below the crest the arches intersect this vertical cross wall at the one-third points between supports, 24 ft. centers (buttresses). The water pressure this slab would have to stand during flood conditions, would be that due to a head of 6 + 12 = 18 ft. or 1125 lbs. per sq. ft. Calling the load uniformly distributed, which is in favor of the slab, we find from tables that a strip of this girder 1 ft. wide will support about 120 lbs. per running ft. if reinforced more than four times as much as called for on the drawing. The steel specified will about take care of stresses due to temperature changes. Unfortunately for the girder, the load is 1125 lbs. per running ft., and not 120 lbs.

Mr. Eastwood claims, in the article, that the structures shown have a minimum factor of safety of 10 or are 1000 per cent strong, and states he employs a stress of 325 lbs. per sq. inch. The arch on one dam is stated to be 9 in. thick 30 ft. span holding a max. water-pressure of 12 ft. It takes an optimist to find the 1000 per cent strength on thin arches, even if stressed less than 325 lbs. per sq. inch.

On the San Dieguito dam design I competed against, the thickness of 9 inches was continued down to where the head was 16 ft., and in addition the span was 50 ft. My judgment was, that it required nearly twice that thickness with a span of only 40 ft. to obtain a factor of safety of between 4 and 5, which is all I attempted. This judgment lost that job for me, but I understand it corresponded pretty closely to the judgment exercised by the state authorities later.

Yours very truly,

L. JORGENSEN.

WESTERN CENTRAL STATION STATISTICS

Preliminary figures of the forthcoming quinquennial report of the central electric light and power stations of several of the western states have been given out by the Bureau of the Census, Department of Commerce.

The statistics relate to the years ending December 31,

1917, 1912, and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; those operated by the Federal Government and state institutions; and those that were idle.

CENTRAL STATIONS OF WASHINGTON

	1917	1912 ⁽¹⁾	1907	Per cent of increase ⁽²⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	88	70	71	.....	.....	.....
Commercial	74	60	65	.....	.....	.....
Municipal	14	10	6	.....	.....	.....
Income	\$4,295,846	\$3,087,721	\$3,410,542	26.0	39.1	— 9.6
Electric service	\$4,201,216	\$2,976,297	\$3,210,814	30.6	41.2	— 7.6
All other	\$ 94,629	\$ 111,424	\$ 190,728	—60.4	—16.1	—41.6
Total expenses, including salaries and wages	\$3,433,747	\$2,270,132	\$2,388,628	43.8	51.3	— 5.0
Number of persons employed.....	1,112	1,078	886	25.6	3.2	21.8
Salaries and wages.....	\$1,093,366	\$ 880,309	\$ 800,441	36.6	24.2	10.0
Total horsepower	151,038	95,884	67,224	124.7	67.5	42.6
Steam engines:						
Number	46	65	64	.....	.....	.....
Horsepower.....	36,270	18,128	11,016	229.2	100.1	64.6
Internal-combustion engines:						
Number	16	3	2	.....	.....	.....
Horsepower.....	600	166	90	.....	263.6	.....
Water wheels:						
Number	70	64	48	.....	.....	.....
Horsepower.....	114,163	77,591	56,118	103.4	47.1	38.3
Kilowatt capacity of dynamos.....	99,875	57,283	66,308	50.6	74.4	—13.6
Output of stations, kilowatt hours.....	242,370,956	71,414,473	257,785,236	— 6.0	239.4	—72.3
Stationary motors served:						
Number	5,678	2,279	1,933	193.7	149.1	17.9
Horsepower	64,694	28,148	29,686	117.9	129.8	— 5.2
Number of street lamps:						
Arc	1,047	2,661	(*)	.....	—60.7	.....
Incandescent, etc.	26,594	20,223	(*)	.....	31.6	.....

Considerable increases are shown for the five-year period 1912-1917, but their significance is diminished by reason of the fact that certain establishments which did both light-and-power and railway business were reported as in the electric-railway industry in 1912 but have been treated as belonging to the light-and-power industry in 1917. The number of establishments increased from 70 in 1912 to 88 in 1917. The actual number of new establishments added since 1912 was 36, of which 32 were commercial and 4 municipal; but, as the result of a number of combinations in the commercial systems, and various other changes, a net increase of only 18 establishments, 14 of which are commercial, is shown by the figures. In 1917 the total income, 97.8 per cent of which was for electric service, amounted to \$4,295,845, an increase

of 39.1 per cent since 1912. The total expenses in 1917 were \$3,433,747, an increase since 1912 of 51.3 per cent. The total horsepower in 1917 was 151,038, an increase of 57.5 per cent as compared with 1912. Water supplied the greater part of the horsepower at each of the three censuses—83.5 per cent in 1907, 80.9 per cent in 1912, and 75.6 per cent in 1917. The total dynamo capacity, 99,875 kilowatts in 1917, shows an increase of 74.4 per cent as compared with 1912. The output of current in 1917 was 242,370,956 kilowatt hours, representing an increase of 239.4 per cent over 1912. The number of arc street lamps decreased from 2,661 in 1912 to 1,047 in 1917, or 60.7 per cent, while the incandescent street lamps increased in number from 20,323 to 26,594, or 31.5 per cent.

(1) Many of the companies operate both light and power stations and electric railways, and their systems of bookkeeping will not always permit the preparation of separate reports. For this reason a number of establishments reported as light and power stations in 1907 were treated as belonging to the electric railways in 1912, and some restored for 1917.

(2) A minus sign (—) denotes decrease. Percentages are omitted where the base is less than 100.

(3) Exclusive of \$5,556,757 in 1917 and 4,422,080 in 1912.

(4) Not available.

CENTRAL STATIONS OF CALIFORNIA

	1917	1912	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	98	112	129	-24.0	-12.5	-13.2
Commercial	79	97	115	-31.3	....	-16.7
Municipal	19	15	14	....	....	....
Income ⁽²⁾	\$40,277,613	\$27,685,573	\$14,416,529	179.4	46.6	92.0
Electric service	\$38,768,970	\$26,461,154	\$13,922,028	178.5	46.6	90.1
All other	\$ 1,508,643	\$ 1,224,419	\$ 494,501	205.1	23.2	147.6
Total expenses, including salaries and wages	\$32,705,192	\$22,803,526	\$12,580,937	160.0	43.4	81.3
Number of persons employed.....	6,167	5,738	3,128	97.2	7.6	83.4
Salaries and wages.....	\$ 7,132,056	\$ 5,823,203	\$ 3,094,193	130.5	22.5	88.2
Total horsepower	1,181,394	848,248	384,673	207.1	39.3	120.5
Steam engines:						
Number	122	169	201	-39.3	-27.8	-15.9
Horsepower	450,180	414,206	159,544	182.0	8.7	159.5
Internal-combustion engines:						
Number	11	11	11	....	....	....
Horsepower	2,237	1,980	16,585	-86.5	13.0	-88.1
Water wheels:						
Number	224	205	172	30.2	9.3	19.2
Horsepower	728,977	432,062	208,444	249.7	68.7	107.3
Kilowatt capacity of dynamos.....	816,974	588,281	238,480	242.6	38.9	146.7
Output of stations, kw-hrs.....	2,746,567,337	1,747,459,041	661,606,309	315.1	57.2	164.1
Stationary motors served:						
Number	21,480	29,059	11,560	85.8	-26.1	151.4
Horsepower	1,410,271	603,742	200,067	604.9	133.6	201.8
Number of street lamps:						
Arc	13,738	19,341	⁽³⁾	-29.0	....
Incandescent, etc.	108,781	75,802	⁽³⁾	43.5	....

⁽¹⁾ A minus sign (—) denotes decrease; percentage omitted where base is less than 100.
⁽²⁾ Exclusive of \$107,617 in 1917 and \$75,817 in 1912, reported by street and electric railway companies as income from sale of electric current.
⁽³⁾ Not available.

Substantial increases are shown in practically all the important items for both five-year periods covered by the table, but as a rule the following increases from 1907 to 1912 were greater than those for the following five years. The number of stations decreased from 129 in 1907 to 112 in 1912, and to 98 in 1917. The actual number of new establishments added since 1912 was 16, of which 12 were commercial and 4 municipal; but, as the result of combinations in the commercial systems, and various other changes, there was a net decrease of 14 establishments, resulting from a decrease of 18 in the commercial and an increase of 4 in the municipal establishments. In 1917 the total income, 96.3 per cent of which was for electric service, amounted to \$40,277,613, the percentages of increase being 45.5 and 92 for the two periods 1912-17 and 1907-12, respectively. The total expenses in 1917

were \$32,705,192, the percentages of increase for the later and earlier five-year periods being 43.4 and 81.2 respectively. The total horsepower in 1917 was 1,181,394, an increase of 39.3 per cent as compared with 1912, and during the preceding five years the rate of increase was 120.5 per cent. Water supplied the greater part of the horsepower at each of the three censuses for which figures are given, 61.7 per cent of the total in 1917, compared with 50.9 in 1912 and 54.2 in 1907. The total dynamo capacity, 816,974 kilowatts in 1917, shows an increase of 38.9 per cent as compared with 1912, the rate of increase during the preceding five-year period being 146.7 per cent. The output of current generated in 1917 was 2,746,567,337 kilowatt hours, representing an increase of 57.2 per cent over 1912, as against 164.1 per cent for the period 1907-12.

CENTRAL STATIONS OF MONTANA

	1917	1912 ⁽¹⁾	1907	Per cent of increase ⁽¹⁾		
				1907-1917	1912-1917	1907-1912
Number of establishments.....	60	29	33	....	....	....
Commercial	64	27	31	....	....	....
Municipal	6	2	2	....	....	....
Income ⁽²⁾	\$9,695,196	\$3,883,410	\$2,469,131	292.7	149.7	57.3
Electric service	\$7,947,011	\$3,292,385	\$2,376,472	234.4	141.4	38.5
All other	\$1,748,185	\$ 591,025	\$ 92,659	1786.7	195.8	537.8
Total expenses, including salaries and wages	\$5,474,003	\$2,411,668	\$1,469,808	272.4	127.0	64.1
Number of persons employed.....	732	614	319	129.5	42.4	61.1
Salaries and wages.....	\$ 969,498	\$ 625,918	\$ 360,768	168.7	54.9	73.5
Total horsepower	345,004	115,710	68,817	401.3	198.2	68.1
Steam engines:						
Number	39	38	31	....	....	....
Horsepower	8,684	12,750	11,830	-26.6	-31.9	7.8
Internal-combustion engines:						
Number	39	1	....	....	....	....
Horsepower	1,403	75	....	....	....	....
Water wheels:						
Number	82	64	62	....	....	....
Horsepower	334,917	102,885	56,987	487.7	225.5	80.5
Kilowatt capacity of dynamos.....	182,079	74,398	39,602	359.8	144.7	87.9
Output of stations, kilowatt hours.....	965,453,777	379,212,617	137,379,261	602.8	154.6	176.0
Stationary motors served ⁽³⁾ :						
Number	7,374	1,962	971	659.4	275.8	102.1
Horsepower	305,241	75,184	33,240	821.3	307.3	126.2
Number of street lamps:						
Arc	1,966	1,560	⁽⁴⁾	26.0	....
Incandescent, etc.	10,664	2,791	⁽⁴⁾	282.1	....

⁽¹⁾ A minus sign (—) denotes decrease; percentage omitted where base is less than 100.

⁽²⁾ Exclusive of \$319,671 in 1917 and \$242,305 in 1912, reported by street and electric railway companies as income from sale of electric current.

⁽³⁾ The number of motors for which the total hp. is given was not fully reported.

⁽⁴⁾ Not available.

Decided increases are shown for most of the important features embraced in the statistics of the electric light and power systems of Montana. These increases, as a rule, are more pronounced for the later five-year period, 1912 to 1917. During this period the total number of establishments increased from 29 to 60, a net gain of 31, 27 of which were commercial and 4 municipal. The total income, which was \$2,469,131 in 1907, increased to \$3,883,410 in 1912 and to \$9,695,196 in 1917, the rates of increase being 57.3 per cent for the earlier and 149.7 per cent for the later five-year period. Although most of the income at each census was from electric service, there was an increase in all other income from \$591,025 in 1912 to \$1,748,185 in 1917, or 195.8 per cent. The total expenses, which were \$2,411,668 in 1912,

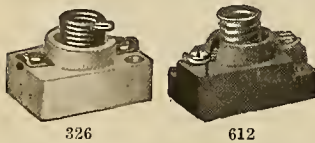
amounted to \$5,474,003 in 1917, an increase of 127 per cent. The total horsepower increased from 115,710 in 1912 to 345,004 in 1917, or at the rate of 198.2 per cent. The horsepower derived from water wheels, which represented the great bulk of the total, increased during the same period from 102,885 to 334,917, or at the rate of 225.5 per cent. The capacity of the generators increased from 39,602 kilowatts in 1907 to 74,398 in 1912 and to 182,079 in 1917, or at the rates of 87.9 per cent and 144.7 per cent, respectively, for the earlier and later five-year periods. The output of stations shows a very rapid growth, from 137,379,261 kilowatt hours in 1907 to 379,212,617 in 1912 and to 965,453,777 in 1917, the rates of increase being 176 per cent and 154.6 per cent for the earlier and later five-year periods, respectively.

LATEST IN EVERYTHING ELECTRICAL

(A plug which fits all electric heating appliances, a device for starting small induction motors from a distance, additions to the line of marine supplies in which the various manufacturers have been specializing and a hospital call switch which meets the special needs of that service are here reviewed. An interesting monorail system which promises to meet the needs of mining companies and lumber firms away from the railroad has been installed in the Northwest.—The Editor.)

BRYANT CANDELABRA CLEAT RECEPTACLES

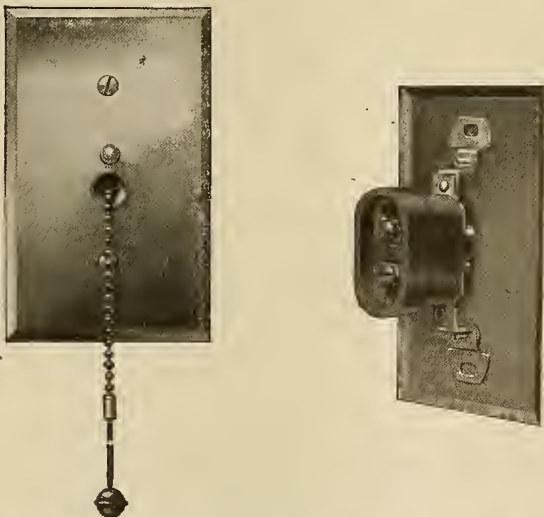
The Bryant candelabra cleat receptacle identified by catalogue number 612, is made with the regular spun copper screw shell and also with a shell, of spring wire, which expands when the lamp base is threaded into it. The tension of this spring wire is more than sufficient to eliminate the possibility of the lamp becoming loosened from contact when subjected to great vibration and jar. The base of the block is molded composition of especially high grade and of the character that is approved by the United States navy, amply strong to stand the most severe service. This is a particularly desirable receptacle for use where it is necessary to illuminate instruments such as are used on board vessels, in the cabs of railroad locomotives, etc. These devices are National Electric Code approved.



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THE HOSPITAL CALL SWITCH

Very elaborate hospital call systems have been devised and installed, and in many instances are giving fairly satisfactory service, but one trouble often arises from their use because a great majority of them employ some form of standard wiring device which the patient uses to signal the nurse. The trouble experienced is due to the fact that the so-called standard wiring devices are not intended for such service. When used for this purpose they often break or fall apart and the result is that the patient may unfortunately



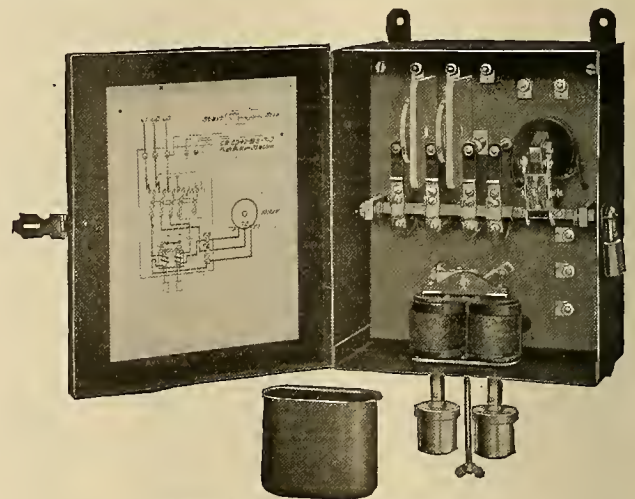
Front and rear of switch. The patient uses linen cord for pulling the switch on and the nurse the button above it for pushing the switch off on this new Hospital Call Switch.

come in contact with the flexible conductor carrying the voltage of the lighting circuit. Further, the flexible conductors carrying the push-button or pendent switch become soiled, worn or damp, thus making the signal inoperative. A new device called a "Hospital Call Switch" has just been developed by the engineers of the Cutler-Hammer Company of Milwaukee. It is made for installation in a standard switch

outlet box and the wiring does not extend beyond the box. No flexible conductors or push-button switches are required for its use, consequently the annoyance of having these parts broken and soiled is eliminated. Further, as the live parts terminate in the wall, there is no possibility of the patient coming in contact with them. Therefore, it has none of the objectionable features spoken of above and besides, offers a means of making a much neater and cheaper installation. From the accompanying illustrations it will be seen that the new device consists of a C-H standard push and pull mechanism slightly modified. The switch is operated by a pull chain. A linen cord placed within easy reach of the patient is used to pull the switch "on,"—the cord being attached to a short piece of chain which extends through a horn in the plate and is attached to a projection through the plate and is used by the nurse to push the switch off. The plate is the same size as those used for wall switches and receptacles and the switches and the plates are made singly or in gangs. The new device may be used on any standard lighting circuit of 125 volts or less.

REMOTE CONTROL STARTERS

There has always been a demand for a device for starting small induction motors from remote points by throwing them directly across the line.



Remote control for small motors

The General Electric Company has recently developed and placed upon the market such a starter, known as the CR-7006 Remote Control Switch, arranged for push button control. This starter is applicable for use with motors up to and including 5 hp., 110 volts, and 7½ hp., 220, 440 and 550 volts. In addition to its starting function it provides protection against under voltage and overload.

The device consists of a 25 ampere, 3 pole, contactor with two inverse time limit gravity reset overload relays mounted on a slate base totally enclosed in a strong sheet iron case.

A small "start and stop" push button station is used as a remote control switch. Completion of the starting circuit, by pressing the "start" button, energizes the coil of the magnetically operated switch, closing the contacts, which

throw the motor directly on the line. Interruption of the circuit, or a radical decrease in voltage, permits the contacts to reopen by gravity, thus stopping the motor, which can not start again until the "start" button is pressed.

The overload relays can be adjusted for various values, ranging from normal up to 50% above normal. They can also be adjusted over a wide range of time values. The relay trips automatically and resets by gravity.

The cover of the enclosing case is furnished with a hasp so that if desired it can be locked in a closed position by padlock.

COMMUTATOR RESURFACER USED TO RENEW COLLECTOR RINGS

For many years it was taken for granted that when the commutator started to spit and spark and showed evidence that it was in need of being dressed up, the only thing to do was to shut down that equipment, remove the commutator and turn it down in a lathe, or temporarily tide over the trouble by using sand paper. A Chicago man decided, however, that there must be a short cut somewhere and set out to find it.

In determining the qualifications of the simplest and easiest way of doing this, he figured that the work should be done, first, while the motor was in service, and secondly, by some inexpensive medium. Experiment finally brought forth a non-conducting composition which, when molded and hardened, presented a continuous abrasive surface that by simple contact with the commutator while in motion, would cut down the mica, ridges and bars. This was put on the market under the name, the Ideal Commutator Resurfacer.

The problem was solved as far as commutators were concerned. For awhile a.c. equipment was not considered, but it was soon found that the same appliance that does the work on the d.c. commutators can be used on the a.c. collector rings, providing it is the right size. The resurfacer is manufactured by the Ideal Commutator Dresser Company of Chicago.

A PLUG FOR ALL CONNECTIONS

Every manufacturer of electric heating appliances is making the terminals different, so that if a woman is using a table stove from Hotpoint and has a flat iron from the General Electric Company and maybe a toaster from the Redtop Company, she has three different cords with three different attachment plugs.



A new patented plug has been gotten out by the Redtop Electric Company which fits on every electrical heating appliance. This means table stoves, room heaters, toasters, flat irons, and so forth.

A specially devised clip maintains perfect contact on either flat or round terminals. Being formed of two pieces it offers a flat surface to make contact with a flat terminal and a round surface to make contact with a round terminal. One of the pieces is made of spring brass and so formed as to preserve its resiliency, insuring a continued perfect contact after long use.

The machine screws, holding the two halves of the case together, screw into threaded bushings which are moulded into the case. Loose nuts are eliminated.

The case is made of black heat proof composition, maulled on the sides and highly polished. No spring is needed

for the cord, the openings for the cord being made with rounded edges which cannot fray the cord.

NEW MONORAIL SYSTEM

What is said to be the first successful monorail system in the United States is now in operation in the Highland-Surprise Mine, on Pine Creek, in Coeur d'Alene district, according to the Pacific Builder and Engineer. The event has caused much interest among operators of the vicinity and several go so far as to say that the system will completely solve the transportation problems that have been so vexatious in the past.

The track as now operated is over a 10 per cent grade leading down the creek from above the mill. Equipped with a 20-horsepower Ford engine and loaded with three tons, the car is said to attain a speed of 18 miles an hour on the up grade. The most important feature of the system is the cheapness of construction, grading being entirely dispensed with and unevenness in contour overcome by the height of the posts supporting the track. The cost of upkeep is therefore practically negligible, while 1000 feet of track can easily be built in a day under ordinary conditions. Grades of from 10 to 15 per cent can be negotiated without difficulty and the inventor claims that the cost of construction over average Coeur d'Alene mountain routes will run at about \$3000 per mile.

Either gasoline or electric power can be used and it is said that one man can attend to haulage of from 100 to 300 tons a day over a distance of several miles at a very low cost. Another feature that will carry strong appeal to mine owners is that the track may be economically constructed in winter. Only two sizes of timbers are used and posts can be made of such length as to place the track above all possibilities of snow troubles. The load is carried on both sides of the car and below the rail. Three or four trailers each carrying 3 tons can be connected with the car. For transportation of ore special side-dumping pockets are provided.

The inventor is W. H. Shepard, who has resided in Seattle for eighteen years and who has devoted the past seven years to perfection of the system. Some time ago he brought his invention to the attention of President W. W. Papesh of the Highland-Surprise Mining Company, who provided the capital to place the project on a business footing and install the short track now in operation. The first trials were so satisfactory that Highland-Surprise has concluded to extend the line to Masonia, the settlement three miles below the mine and on the line of the branch road of the O. W. R. & N. Co. now being constructed up Pine Creek.

While monorail cars are now in successful use in many parts of Europe, no serious attempt has previously been made to apply the system to ore-handling in mountain regions and it seems reasonable to look for a complete revolution in transportation methods at points where conditions are similar to those that have caused so much trouble to Highland-Surprise management. It is worthy of note that a monorail system had been in use at Brussels for ten years, preceding the war, while another, in operation in Ireland, is said to attain a speed of 80 miles an hour.

From the foregoing it would seem that Mr. Shepard has produced something of undoubted economic and practical value for the kind of transportation that has heretofore been so costly and difficult. He claims that he can build this line for \$3000 a mile. Transportation is a problem that is occupying the best thought of the country because future progress is so dependent upon it, and to the industrial world this monorail system will mean the opening of new projects and the revival of many that have long lain dormant whose products were sorely needed to meet the demands of the nation as well as private industry.

BOOKS AND BULLETINS

A new 64-page, 8½ in. by 10 in. catalog entitled "C-H Wiring Devices—Push Button Specialties," is being distributed by The Cutler-Hammer Manufacturing Company of Milwaukee. The appearance and contents indicate that much time and care were taken in the preparation of this book and that practically all the wiring devices and push button specialties made by this company are illustrated, described and listed. The contractor-dealer and large user of conduit fittings will find the center spread extremely useful. It is devoted to a complete table which lists the conduit fittings made by eleven different manufacturers, and gives the form and catalogue number of the various fittings that may be readily used for mounting C-H receptacles and sockets. The book is well indexed and bound in striking orange buff colored cover. It is intended for distribution to jobbers, dealers, contractors, central stations, architects and others interested.

Manganese and Chromium in California

A report entitled "Manganese and Chromium in California," known as Bulletin No. 76, is now being distributed by the State Mining Bureau. California has long been known to contain deposits of commercial ores of both chromium and manganese; but only a limited production was made for many years, owing to the high cost of placing these materials on the principal markets in the eastern states. The data, of course, had particular war significance, but the volume is still of value in that it is the only publication of recent date containing comprehensive and detailed data on the manganese and chromium resources of the entire state of California. Considerable information is given regarding concentration of these ores, particularly of chromite. The volume is well illustrated with photographs and maps.

Are Prices Going Down?

The U. S. Department of Labor has published a monograph by Professor Irving Fisher of the Department of Political Economy, Yale University, on the subject of prices in the period ahead of us. Professor Fisher confirms the conviction that has been growing in the minds of many men throughout the country, that the high price level to which we have attained is no temporary thing but permanent. We are simply using more counters than before in effecting exchanges. To everyone engaged in trade, finance or industry, Professor Fisher's message has especial importance. In general, prices, and hence wages, are not going to fall. In the case of particular products, there may be particular reasons why prices may drop, but in the absence of definite knowledge of such special reasons it is safe to assume that prices are not going to drop. In other words, you can go ahead with the assurance that even if it costs you more now to produce, you will be able to sell your product at a higher price. There is a new price level all around.

Westinghouse New Annual Catalogue

The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has issued a complete catalogue in which all of their electrical supplies are listed. The catalogue is made up of 1264 pages of description pertaining to the products of the company and a score of other pages contain a complete cross index, and index to style numbers, and a table of "Approximate Cost Multipliers," which enables one to figure the approximate cost of all supplies listed. The book contains also miscellaneous information of a technical and engineering nature. Practical suggestions for the use of many kinds of apparatus for the transmission and utilization of electric power are given.

A REVIEW OF INTEREST

It will be interesting to readers of the Journal of Electricity to follow some of the comments that have been made in the literature of the world concerning the series of articles on fuel oil and steam engineering that have appeared in the columns of the Journal of Electricity from time to time for the past two years under the authorship of Robert Sibley and Charles H. Delany. It will be recalled that these articles were published in book form last June under the title "Elements of Fuel Oil and Steam Engineering." Since that time the book has been reviewed by many noted authorities. The splendid tributes paid to this work have from time to time been published in the columns of the Journal of Electricity. One of the most recent and most comprehensive reviews is that which appeared in the Journal of the American Society of Mechanical Engineers signed by B. R. T. Collins.

Book Review by A. S. M. E.

Elements of Fuel Oil and Steam Engineering: A Practical Treatise Dealing with Fuel Oil, for the Central Station Man, the Power Plant Operator, the Mechanical Engineer and the Student. By Robert Sibley, B. S., and Charles H. Delany, B. S., M. M. E., Members Am. Soc. M. E. Technical Publishing Company, San Francisco, 1918. First Edition. Cloth, 6 x 9 in., xiv + 320 pp., 127 illustrations, charts and figures. \$3 net.

This book has as its underlying theme a study of fuel-oil power-plant operation and the use of evaporative tests in increasing the efficiency of oil-fired plants. The subject-matter has been treated in three main subdivisions: First, an exposition of the elementary laws of steam engineering; second, the processes involved in the utilization of fuel oil in the modern power plant; and third, the testing of boilers when oil-fired.

A new method has been used in treating the first subdivision, in that the viewpoint taken is that of the oil-fired instead of the coal-fired power-plant operator. This subdivision naturally requires the largest portion of the work.

The five chapters on Furnaces, Burner Classification, Gravity, Moisture Content, and Heating Value of Oils contain the gist of the information which will be of value to the inexperienced engineer whether he views the subject from a consulting or operating standpoint. The engineer who has had considerable experience in this line will be interested in the chapters on Suggestions for Fuel-Oil Tests and Their Tabulation, and the Use of Evaporative Tests in Increasing Efficiency of Oil-Fired Boilers, as these chapters, especially the latter, contain definite information worked out from practical experience in regard to furnace arrangement, oil burners, draft, flue-gas analysis and regulation.

The most interesting part to the experienced fuel-oil engineer is Appendix 2, which contains the report of conclusions in full of the committee appointed by the Governor of California, in the latter part of 1917, to investigate the fuel-oil situation in that state and report their conclusions and recommendations. These conclusions cover utilization, production, consumption, storage, conservation and the remedy for the present shortage of oil in California. This is a remarkable report which should be read by every engineer interested in the future of fuel oil in this country.

We believe the authors have succeeded admirably in accomplishing the purposes which the book attempts to cover. It is unquestionably the best work of its kind for students of steam engineering who are interested in fuel oil. It is also of value to engineers, both consulting and operating, as it gives a large amount of information hitherto not covered by any work of this kind, and at the same time brings together much important matter which has appeared at various times in various forms. The subject-matter is clearly developed, and illustrated examples are worked out in great detail. The book is also profusely illustrated. To sum up, we believe this work occupies a field hitherto vacant in this particular branch of engineering.

B. R. T. COLLINS.

NEW ELECTRICAL DEVELOPMENTS

(A generally quiet period is reported from the Northwest, while in the Pacific Central District plans for new power projects are still coming forward. Several rate decisions of interest have been made by the railroad commission. In the Southwest, the Southern California Edison Company starts active work on its new construction, and in the Intermountain District a tendency toward the establishment of municipal plants by small communities is to be noted.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—Only two bids were received by the city for the purchase of \$245,000 municipal light and power plant and system bonds.

SEATTLE, WASH.—The city council has appropriated \$20,000 for repairs to the Cedar river power plant pipe line and \$15,000 for light department construction work.

COLFAX, WASH.—The city council is considering the installation of a municipal electric light plant to furnish electricity for street lighting and pumping water to the reservoir.

LEBANON, ORE.—The Lebanon Light & Water Company has purchased a site on which it proposes to erect a new power plant. The old plant will be used for a pumping station.

PINEVILLE, ORE.—The Ochoco Irrigation District has closed a contract employing the Puget Sound Bridge and Dredging Company, Central Building, Seattle, Wash., to build a large hydraulic earth-fill dam.

YAKIMA, WASH.—A power development of about 10,000 h.p. in the Wapato project is included in the plans of the United States Indian Service. Power from this source will be available only during the irrigation season.

VANCOUVER, B. C.—The Pacific Electric Welder & Manufacturing Company, 1018 First avenue, Seattle, Wash., contemplates the construction of a factory on Industrial Island, to cost, including machinery, between \$60,000 and \$70,000.

MARSHFIELD, ORE.—Reconstruction of the dutch ovens under the boilers of the power plant at the Smith mill, at a cost of \$2500, has been decided upon by the Mountain States Power Company, according to Manager A. L. Martin.

SEATTLE, WASH.—Express service for the outside districts night and morning is one of the improvements contemplated by Thomas F. Murphine, superintendent of the utilities department, Seattle, when the city takes over the street railway system of the Puget Sound Traction Light & Power Company.

KLAMATH FALLS, ORE.—The California-Oregon Power Company of this place has decided to proceed with the construction of a dam across the head of Link river near here in accordance with the terms of a contract with the government for use of the power house at Copco, California.

TACOMA, WASH.—That the municipal street railway is not earning enough money to pay interest on outstanding bond issues is the statement of City Comptroller John Roberts of Tacoma to the city council. The comptroller urged the council to find some method of meeting unpaid bills.

PORTLAND, ORE.—The entire property of the Home Telephone and Telegraph Company, appraised at \$2,100,000, was sold at public auction at the courthouse and bid in for \$500,000 by the Security Savings and Trust Company, in accordance with previous arrangements with the bondholders.

SELAH, WASH.—The Pacific Power & Light Company has just closed a contract for the construction of a 6600 volt, single-phase distribution line running east from this place to serve nine ranches. The company is also building a 6600-volt, three-phase line to serve Terrace Heights pumping station No. 2, southwest of the Yakima Country Club house.

ASTORIA, ORE.—Plans are being prepared by the Pacific Power & Light Company for the erection of a 4500-h.p. electric generating plant adjoining its present plant on Astor street. Additional power is required to supply service to the proposed new 3000-barrel flour mill of the Astor Flouring Mill Company and for the extension of the Astoria Marine Iron Works.

PORTLAND, ORE.—Construction of a tunnel through Council Crest connecting Portland with the rich Tualatin valley by a direct route is proposed by Commissioner Perkins as a city reconstruction project. Previous efforts in behalf of the Tualatin valley tunnel brought estimates of \$1,500,000 and it is probable that with the increased cost of labor and material the project now would cost approximately \$2,000,000.

NORTH BEND, ORE.—The Mountain States Power Company, it is reported, is arranging for the removal of its power plant from Marshfield to North Bend. Until recently the plant has been operated in conjunction with the lumber mill of the C. A. Smith Lumber Company. The closing down of the mill has necessitated the removal of the plant or the installation of boilers and equipment. When the plant is removed new machinery will be installed.

SEATTLE, WASH.—Supt. of Utilities Thomas F. Murphine of Seattle has recommended to the city utilities committee of the city council that the city discontinue the sale of six car tickets for 25 cents. In connection with the recommendation for the discontinuance of tickets, Mr. Murphine said that the influenza and the loss by the use of tickets had caused the present municipal lines to run behind \$3,657 in the last three months. Another recommendation was for the elimination of the automobile parking privileges on First, Second and Third avenues.

THE PACIFIC CENTRAL DISTRICT

PORTERVILLE, CAL.—The city council has under consideration a municipal power plant.

COALINGA, CAL.—The net income of the Coalinga Gas and Power Company in 1918 is reported as \$3,462.

RED BLUFF, CAL.—The Bend Irrigation Company is to install considerable concrete pipe to perfect its distributing system.

HONOLULU, T. H.—The Hawaiian Electric Company is planning to increase its capital to \$5,000,000, big improvements being contemplated.

SOUTH SAN FRANCISCO, CAL.—A temporary steel tower is being erected at the Federal wireless station to replace the one destroyed by fire.

BAKERSFIELD, CAL.—The supervisors have granted to the Valley Natural Gas Company permission to lay a pipe under the southern boundary of section 10.

KERN COUNTY, CAL.—Reporting for the year 1918 the Kern Mutual Telephone Company shows a net income of \$13,622, but deductions therefrom amount to \$45,841.

SAN FRANCISCO, CAL.—Lemuel J. Miller, manager of the Postal Telegraph Cable Company, announced that the Pacific cable, connecting with Manila, China, Japan, and the Dutch East Indies, was restored after interruption since February 17th.

BIG PINE, CAL.—Joseph Mears and Mary Dunlop Mears, of Big Pine, have applied for 25 inches of the water of Birch Creek, Inyo County, for power purposes. Permit has been granted for 25/40ths cubic foot per second.

BAKERSFIELD, CAL.—The Southern California Edison Company will purchase \$9,000,000 worth of material in Kern county for its new development projects, according to H. C. Katze of the Chamber of Commerce.

REDDING, CAL.—Contracts for the construction of the Hoover tunnel and the Messelbeck dam of the Happy Valley irrigation project have been awarded to N. A. Kramer of San Francisco. The contract price for the work was \$315,000.

NEVADA CITY, CAL.—The big snow storm in the mountains caused the Deer Creek, Alta and Drum power plants of the Pacific Gas and Electric Company to shut down temporarily owing to snow blocking the ditches supplying the power houses with water.

MARYSVILLE, CAL.—The proposed formation of the Yuba Irrigation District is to be protested before the Board of Supervisors when the petition for forming the district comes up for a hearing. The protest is to come from Hallwood Irrigation District people.

FRESNO, CAL.—The California Peach Growers, Inc., Fresno, have applied for 4 cubic feet per second of Middle Fork, Tuolumne river, Tuolumne county, tributary Tuolumne river, for power purposes. The water is to be used for operation of a saw mill and camp purposes.

VISALIA, CAL.—The Central California Electric Company, with plants in Lindsay, Visalia and Tulare, has received its incorporation charter and at a meeting held recently elected directors as follows: H. J. Verfurth, Geo. Delano, Wm. Tarbel, J. W. Faux, and C. Bartholomew. The company is incorporated for \$75,000.

LIVE OAK, CAL.—The Sutter Basin Improvement Company is putting in a \$65,000 electric pumping plant and has applied to the State Water Commission for a permit to appropriate 42 cubic feet of water per second from the Sacramento river. The main canal is one mile long, and the water will irrigate 3240 acres.

SAN FRANCISCO, CAL.—California Natural Gas & Development Company has been incorporated here to manufacture, generate and distribute gas and electricity. The capital stock is \$1,000,000, with 1,000,000 shares at \$1 each. Subscribers are: Chas. H. Ham, Stanley L. King, Charles Williams, Albin Youngholm and P. C. Black.

VISALIA, CAL.—Surveys will be started in the near future in Tulare county by the United States Department of Agriculture to determine the amount of flood waters wasted in the rivers of each year. The figures will form the basis of plans for a system of storage through which this water may be conserved throughout the irrigation system.

BIG BAR, CAL.—Frank B. Hoffman of Big Bar has made application for 2 cubic feet per second of Rowdy Creek, Trinity county, tributary of Trinity river, for supplying power to operate a saw mill. The diversion works consist of a dam and ditch and flue 900 ft. long. Power will be developed by means of a water wheel—fall 125 ft.

SAN FRANCISCO, CAL.—The State Railroad Commission has issued a supplemental order authorizing the Sierra & San Francisco Power Company to reduce its charges for power served to large industrial consumers. The order substitutes for a recently authorized surcharge of three mills a kilowatt hour a graduated scale to become effective March 25.

BRANDY CITY, CAL.—Pember S. Castleman, Brandy City, has applied for 400 cubic feet per second of the North Fork of Feather river, Yuba county, tributary of Feather river, for power purposes. The diversion works consist of a concrete arch dam 145 ft. high, 400 ft. long on top and 50 ft. long on bottom, and a pipe line 1 mile long. Estimated cost of works, \$85,000.

FRESNO, CAL.—Four of the ten districts affected by the Pine Flat project are now organizing and Fresno district recently held a meeting to vote on the same subject, according to a report of the Kings River Conservation District executive committee, which has drawn up a resolution asking state assistance in measuring the waters of Kings river.

MERCED, CAL.—Plans are being prepared by Allison & Allison, architects, 1405 Hibernian Building, Los Angeles, for a group of buildings for the Merced Union High School district, consisting of academic, administration and assembly building, domestic science, manual training and commerce building, power house and gymnasium. About \$130,000 is available for the project.

TURLOCK, CAL.—W. D. Wagner, secretary of the Merced War Fund Association, has been appointed campaign manager by the Merced Irrigation District Campaign Committee, and commences at once his work of heading the campaign for the formation of a district of approximately 175,000 acres to be irrigated by storage water to be provided by the district system.

CORCORAN, CAL.—A project is in process of formation to be known as the Corcoran Irrigation District, and within a short time plans will have progressed far enough for the presentation of a petition to the board of supervisors and the other necessary legal steps taken for its final organization. The territory will include 50,000 acres of land of which the city of Corcoran will be about the center.

YREKA, CAL.—A group of agriculturists of Montague and Yreka have made application for 10 cubic feet per second of Shasta River, Siskiyou county, tributary to Klamath river, for agricultural purposes. The water will be diverted from Klamath river by an electric pump and conveyed through a pipe line about 592 feet long to the head of the main ditch, which will be five miles in length. Cost, \$5,000.

PLACERVILLE, CAL.—Purchase by the growers of a portion of the system of the Western States Gas & Electric Company here and the formation of a company which will distribute water sufficient for the irrigation of approximately 12,000 acres of land are the features of the compromise which is to be effected in the case of the El Dorado County Water Users' Association against the Western States Gas & Electric Company.

OROVILLE, CAL.—The Great Western Power Company of California engineers and surveyors have established a camp two miles east of Belden in the Feather river canyon to start surveys for the \$6,000,000 hydroelectric plant, construction of which will begin in Butt valley this year. The first construction work is to be the building of a railroad up Butt creek to the site of the power plant, so material and machinery may be unloaded at the site.

SACRAMENTO, CAL.—An exploration party of the State Engineering Department will begin the task of examining and selecting sites for seven reservoirs along streams tributary to Sacramento river for the storage of flood waters to be used for irrigation and for hydro-electric power development under State supervision, as announced by W. F. McClure, State Engineer. Proposed sites along the Bear, Feather, American and Yuba rivers and other streams between Sacramento and Redding will be examined.

SAN FRANCISCO, CAL.—The Pacific Gas and Electric Company in an effort to adjust its rate schedules for metered commercial, agricultural and general power has applied to the State Railroad Commission for authority to substitute schedules that have been found to be more in accordance with the demands for service in the various cities. The substitution of rates will, according to the company's petition, decrease the charges for electric energy to many consumers and increase the bills of a few. In the event of an increase under the readjustment the company asks permission to continue the old rates to avoid any additional charge.

SAN FRANCISCO, CAL.—Indications are that two bondholders' committees of United Railroads of San Francisco have come to an agreement relative to an amended plan for reorganization of the company and that some announcement will be forthcoming shortly. The committees had under consideration an amended plan which provided for the taking up at par of \$5,200,000 underlying bonds of United Railroads. To take care of the \$23,500,000 general mortgage first sinking fund gold 4s, it was proposed to substitute preferred stock or income bonds or both.

MONTEREY, CAL.—Authority to increase its present rates for electric energy by surcharges that will mean an average raise of 20 per cent has been granted the Coast Valleys Gas and Electric Company by the Railroad Commission, but the order also carried with it instructions to the company to improve its service. The company's contemplated improvements call for the expenditure of \$25,000 in new capital and consist of the overhauling of the steam plant at Monterey, line and transformer improvements at Monterey, the rebuilding of the Salinas substation and installation of modern switching apparatus, installation of feeder voltage regulators at Monterey and Salinas and increased substation attendance.

FRESNO, CAL.—Horace M. Woolley, of San Francisco, has applied for 600 cubic feet per second of the water of Kings river, Fresno county, tributary to San Joaquin river, for the development of electric power. The diversion dam is to be 50 ft. high, 200 ft. long on top and 180 ft. long on the bottom, gravity type, concrete overflow dam. Canal 10½ miles long. Water will be developed by means of impulse water wheels direct connected to electric generators. The total amount of power developed, 65000 Th. hp. Total fall utilized, 1000 feet. The water is to be returned to Kings river after use. Estimated cost of proposed works, five to six million dollars.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—The Superior Light & Heat Company of this city has applied for dissolution.

EL CENTRO, CAL.—Arrangements have been completed by the Holton Power Company for remodeling its plant at Sixth and Main streets.

SAN PEDRO, CAL.—A new passenger station will be constructed by the Pacific Electric Railway at San Pedro, to be erected on the site of the old Southern Pacific freight station.

POMONA, CAL.—The Pomona Valley Telephone and Telegraph Company has reported to the Railroad Commission for the year ended December 31, 1918, showing a gross operating revenue of \$75,974.

LORDSBURG, N. M.—The purchase of a 1000 h.p. boiler, a 1000 h.p. steam turbine and steam equipment is reported under consideration by the Eighty Five Mining Company.

SANTA BARBARA, CAL.—The Santa Barbara Gas Company has sold out to the Southern Counties Company. Large extensions are expected, and natural gas will be piped from the Santa Maria oil fields.

EL SEGUNDA, CAL.—Pipes will be laid from Redondo along El Camino Real and the Redondo Boulevard to Ballona avenue, for gas connection to El Segunda. The Southern California Gas Company is doing the work.

SANTA BARBARA, CAL.—The Big Dam at Gibraltar Rock on the Santa Ynez is almost completed. When it is finished a lake six miles long will be formed capable of supplying a large city. It is expected that electric power will be developed later.

LOS ANGELES, CAL.—Application has been made to the city council for a franchise granting the right to construct and for a period of not less than 21 years, to operate an additional electric street and interurban railroad track

south of and adjacent to the present San Pedro-Wilmington-Long Beach railroad.

LOS ANGELES, CAL.—In furtherance of plans for the extension of its service into Central and Northern California, the Southern Counties Gas Company of California applied to the State Railroad Commission for permission to purchase the gas properties of the Santa Barbara Gas and Electric Company and the Southern California Edison Company for \$825,000 cash.

LOS ANGELES, CAL.—Pasadena is considering the construction of a municipal electric railway to Los Angeles, and has been offered an elevated railroad on a suspended car system. It is claimed that the trip between the cities on such a railroad could be made in eight minutes. The estimated cost is \$1,000,000, about one-third that asked for a municipal line.

LOS ANGELES, CAL.—Having completed its new finances by the sale of \$16,000,000 of bonds and debentures, the Southern California Edison Company has announced the starting of active work on a hydroelectric construction program that will mean the eventual expenditure of \$125,000,000. It will take \$20,000,000 to carry out the plans for the next three years, and their completion, it is stated, will mean the development of 150,000 horsepower in new hydroelectric plants for the industrial and agricultural requirements of the ten counties, with their 233 cities and towns, in which the company provides the electric supply to a rapidly growing population.

THE INTER-MOUNTAIN DISTRICT

WHITEFISH, MONT.—The city council has appointed a committee to make investigations as to the feasibility of establishing a municipal electric light plant in Whitefish.

PAROWAN, UTAH.—Application has been filed with George F. McGonagle, state engineer, by John L. Lowden of Parowan for permission to use 10 second-feet of water to be taken from Pargonah Creek in Iron County. The power is to be utilized to generate electricity.

SALESVILLE, MONT.—A project is under way for the installation of a hydroelectric power plant on Big Bear Creek, five miles south of here, to furnish electricity for lamps and motors in Salesville and the farmers in this district.

BURLEY, IDA.—The installation of four new automatic circuit breakers in the pumping units at the second lift station of the Minidoka project has been completed. The overhauling of the pumping stations is in progress.

PHOENIX, ARIZ.—The machinery on the power plants of the Salt River project has been overhauled. At the Chandler power plant, all old equipment has been removed and work started on excavation and tearing down the old walls preparatory to erecting a building and draft tube.

YERINGTON, NEV.—A petition asking the Lyon County Commissioners to authorize the creation of an irrigation district, comprising 130,000 acres of land, has been signed by 75 per cent of the landowners of the Smith, Mason and Lower Antelope valleys. It is planned to ask for the reclamation of the district.

CROOK, COL.—An election will soon be held to vote on the proposal to issue \$20,000 in bonds for the installation of an electric light plant and water works systems in Crook. Plans are being prepared by the Henningson Engineering Company, National Bank Building, Omaha, Neb.

CARSON CITY, NEV.—To discuss the advisability of further bonding the city of Carson to acquire municipal power and water plants, a large gathering of people met at the Greater Carson Club. The report brought in by the committee appointed to consider the feasibility of the scheme was adopted and a resolution passed requesting Ormsby county's representatives in the legislature to introduce a bill authorizing the issuance of bonds.



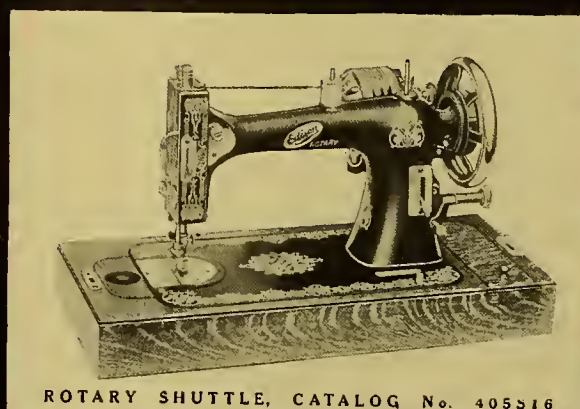
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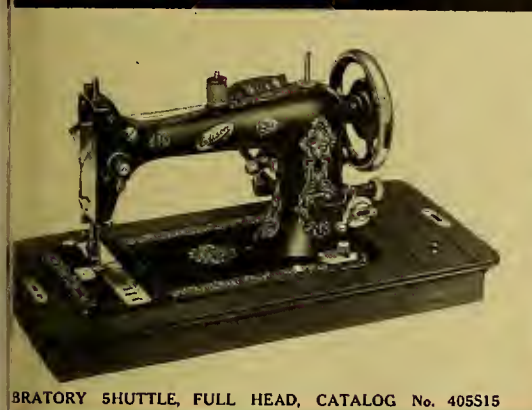
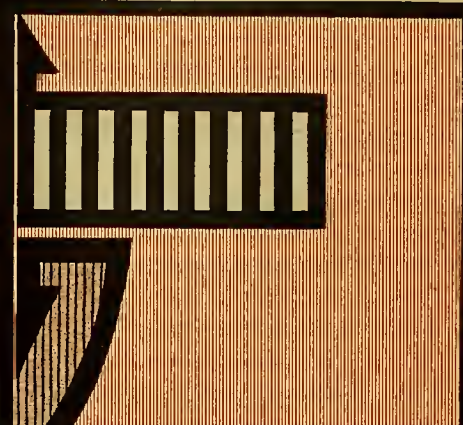
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SAN FRANCISCO, APRIL 15, 1919

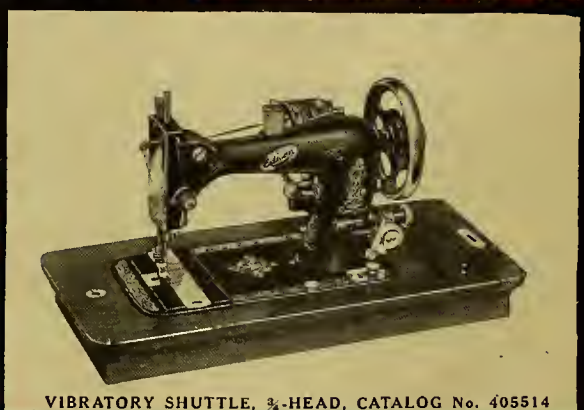
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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, APRIL 15, 1919

NUMBER 8

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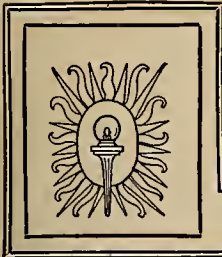
ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER



AEROPLANES HOVERING OVER SAN DIEGO:—As the aeroplanes proved to be the eyes of our victorious armies in the trying period of the war, so the men of the electrical industry convening at San Diego the latter part of April and the early part of May will sense the new needs of industry in these days of giant readjustment and thus enable the West to maintain its position of daring in engineering accomplishment and contribute from its native values a substantial part in the destiny of the new world now before us.

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JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, APRIL 15, 1919

Number 8

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VICTORY LIBERTY LOAN! Keep the boys proud of the fact that they fought for you. It's not much of a sacrifice in comparison with theirs, is it?—and it helps you to some feeling of self respect when you see a boy on crutches. Keep our honor as clean as they have kept it. We have no right to claim the victory until we have paid the bill. **FINISH THE JOB.**

The Journal of Electricity extends its greetings to the great conventions soon to convene at the Coronado Hotel at San Diego, California. The Pacific Division of the National Electrical Supply Jobbers' Association, the California Association of Electrical Contractors and Dealers and the Pacific Coast Section, N. E. L. A., have indeed passed through trying days in the year just completed but, like our great allied armies who fought shoulder to shoulder in a common cause, they have emerged gloriously victorious.

Perhaps in no other quarter of the world did the electric power industry rise to meet the emergencies of the world crisis by more efficient performance of feats in engineering and economic design hitherto thought unattainable than in the region west of the Rocky Mountains, where electricity is used per capita to a degree representing four times the per capita use prevailing in the remainder of the nation.

And in the performance of these war time duties it fell to the lot of the Journal of Electricity to be the medium for the instilling of hope, courage and constructive imagination to the industry at large. The task was undertaken and that its columns in editorial and advertising strength grew to proportions which place it today among the great electrical periodicals of the day offer the best proof that this aid proved of value to the industry it has tried so whole-heartedly to serve.

This opportunity is taken to thank our advertisers who have so generously backed the endeavors of the Journal of Electricity to be of service and to express our deep appreciation to the industry at large for the magnificent encouragement that has been given us from all sections of the nation.

In the West, during the period of war stress, many helpful economies in power development were brought about that must inevitably be felt in the industrial life of the nation for many years to come. Not only was the production of fuel oil increased but the generation and

utilization of electric power both from water resources and from fuel supply was vastly forwarded. In some instances the task involved the establishment of new records in magnitude of engineering attainment such as the interconnected systems of long distance power lines which have not been even approached in length of transmission or magnitude of distribution anywhere else in the world.

But perhaps the advances that have been made in automatic control will ultimately prove of even more lasting benefit to the industry in lessening labor costs and hence in decreasing the cost of power production, than any other single cause.

The one-man cars for street railways, the automatic control of substations such for instance as the new installation from Salt Lake City to Salt Air in Utah, and the automatic control of power house generators as installed quite recently by the San Joaquin Light & Power Corporation, are forceful instances of this recent trend in economic design.

The Crane Valley power house of the San Joaquin Light & Power Corporation is of unusual interest. Here it is estimated that an average of over three million and one-half kilowatt-hours will be saved by taking advantage of power not hitherto used in the rise and fall of the lake level of Crane Valley Reservoir.

The unusual feature of variable head, ranging from 120 feet down to 80 feet, has been successfully overcome. This power house, in addition to a second installation below, is operated without attendants and only the regular dam tender and reservoir tender make visits to the plant from time to time. An alarm system is installed in the caretaker's cottage so that he is notified if the machine is tripped off the line. The machine, in the meantime, may attain runaway speed. However, should the machine trip off the line and increase in speed, a centrifugal switch on the shaft of the unit closes a circuit on the wicket gate, operating a motor which closes the wickets and shuts down the machine. The water in the ditch immediately starts to rise, and flows over the weir by-pass until such time as the caretaker

**New Advances
in Automatic
Control**

of the plant arrives and puts the machine back on the line.

The recent advances in automatic control witnessed on all sides combined with the irresistible trend toward outdoor switches and transformer stations augur well for increased economic power generation and lend a certain hope to the power situation that is certainly pleasing to contemplate.

Someone has wisely said that the thoughts of the man largely determine what the man really is.

Sidelights on Engineering Education

So in the engineering profession, analysis of the thoughts that are creating the driving vision for effort on tomorrow will give us the best idea of the engineer of today and as a consequence we may formulate some outline for fundamentals that should prevail in the education of the modern engineer that he may render the highest service to the nation.

A casual glance over the papers in this issue of the Journal of Electricity—papers that represent the technical study of a great industry in the nation in its preparation for annual convention study—reveals the fact that fully fifty per cent of effort is devoted to questions directly concerned with finance, economics and public relations. The remaining papers deal with engineering discussion of a technical nature, but fundamentally, here too, technical knowledge is not of itself sufficient. Public relations, finance and economics again play a vital part in the choice of design.

It is not to be denied that highly specialized training will always be in demand but the engineer versed in economics, finance and a fundamental knowledge of executive control combined with the foundation for building ideals of statecraft and public relations must be acknowledged as the highest and most useful type of citizenship, and the type that will make the largest numerical demand upon our engineering schools and colleges.

Unquestionably the undergraduate days of the engineering school must be devoted more to meeting this broader requirement for citizenship.

On the other hand, to prepare men for the demands of highly specialized work the thought is suggesting itself continually to the professional engineer that our great universities and colleges must have more of nation-wide cooperation among themselves, looking toward an avoidance of duplication of effort. Let there be but one university in America, for instance, where ceramic engineering is developed to its highest degree, another where electric storage battery engineering is supreme, still another for high tension study, and so on down the list. Such a nation-wide coordination would make it possible for the engineer who in his undergraduate days has laid a splendid foundation in fundamentals to go at a later date to that particular institution where his particular needs may be met.

For this higher work not only must close cooperation among universities be maintained but the contact with the business and professional world must also prevail.

It appears that with few exceptions practically all American schools of engineering plan their undergraduate curricula with a view primarily to technical and professional training, to the neglect very often of opportunities for contact with certain departments of instruction which have much to offer in the way of vital preparation for citizenship and the conditions of modern political and economic life. Consequently any revision of curricula in a single institution will probably be difficult, unless there can be set in motion a plan for revision and reorganization which shall be nation-wide.

Men of the electrical industry can do much in helping to formulate the new vision for engineering training and it is to be hoped that more thought may be given to this important subject.

Perhaps no other factor has proven more helpful in former years in the development of the vast undeveloped resources of America than its magnificent system of railways.

The Passing of the Railway Excursion

In the West this has most emphatically been the case. Literally millions of American citizens have been transported westward, often seeking only relaxation, but later to become so impressed with the tremendous opportunities awaiting personal touch as to become an enthusiastic and integral part of the human element engaged in developing the values native to our wonderful country.

But the railways did not stop here. The dining cars were laden with the products of the soil over which the road passed, the car libraries were profuse with carefully selected magazines giving valuable general and technical information concerning the production and natural resources of the country, and special excursions were encouraged in instances where the event was to partake of vital discussion pertaining to more efficient, economic and intensified development of the section of country served by the railway.

But now it is to be regretted that things are different. The dining car service partakes of a standardization and sameness from one end of the country to the other. No longer are helpful magazines carried in the libraries and buffets, and as for the excursion, it is a thing of the past.

The case of the helpful convention that is to be held at Coronado Hotel April 30-May 2 is a striking instance. The transportation manager for this, the greatest of all conventions electrical in the West this year, reports that the United States Railway Administration refuses to grant any concessions in rates over the established schedule of 3 cents per mile, and also requires that railroad tickets and Pullman accommodations be purchased outright. While we cheerfully accepted these restrictions during the period of war time necessity there is considerable question at this time as to the need for continuing such drastic restrictions.

As an instance of the vital part this convention plays in aiding the government in its work, it will

be recalled that this same convention met last year at Del Monte and was largely responsible for the concerted and united effort on the part of all central stations in this vast territory which was evidenced in the conservation and pooling of power resources and the saving of fuel oil. This action, too, was undoubtedly reflected in promoting the government's program of shipbuilding on the Pacific Coast and other war industries.

It is unfortunate that so little cooperation is displayed by the government in this typical instance. Under this policy the West perhaps will suffer least of all, for with her splendid system of highways and possibilities of outdoor life, the automobile will now be appealed to more than ever before and doubtless in large measure will fill the need denied by the Railway Administration. But to the country as a whole the problem is not so easily disposed of. Without concessions of some sort, however, the railway will unquestionably pass in its usefulness as one of the prime factors in the furtherance of national development, and unfortunately much of its productive revenue will be diverted to other means of transportation.

No longer can the engineer afford to view great problems of the day in any other light than in its broadest aspect, devoid of selfish interest and partisan feeling. The recent action of one of the largest sections of the American Institute of Electrical Engineers in unanimously approving the appointment of a comprehensive committee from among its most distinguished engineer members to investigate railway electrification is a beginning in the right direction and is highly to be commended.

It is doubtful if an economic problem of more stupendous magnitude confronts the nation today than that of railway electrification. But while the problem in itself is of vast proportions, the resulting good to be accomplished is within the same order of magnitude.

It is quite generally recognized that seven major reasons exist for urging upon the nation as a whole an early beginning in the matter of systematic extension of the method electrical in railway operation. As tersely put by an eastern engineer in a recent address, these seven major points are:

- (1) The necessity for freer movement of traffic over existing track facilities.
- (2) The greater strength of rolling stock, permitting the operation of higher tonnage trains.
- (3) The availability of large amounts of electric power now produced at advantageous cost.
- (4) The greatly enhanced cost of fuel which it is believed will remain permanently at a high figure.

- (5) The need for more expeditious movement of trains, due to the modified conditions in the employment of labor in train service.
- (6) The general shortage of both skilled and unskilled labor available for railroad operation and maintenance.
- (7) Recognition of need of increased capacity for movement of traffic, thereby avoiding embargoes and removing the restriction of growth and general prosperity.

Railway electrification is a matter not alone of interest to the railways and their owners, but, first and foremost, to the people at large it is of prime importance. There has been enough authentic data accumulated and published broadcast throughout the nation to convince thoughtful men that economies to be gained and vast conservation in natural resources to be brought about through railway electrification are well within the range of possibility. Indeed, so evident is this fact that every possible pressure should be brought to bear upon all parties to the issue to give the matter the freest and fullest investigation.

We hear much nowadays about the broadened field of usefulness of the engineer and our national engineering societies are urging upon our membership to engage more and more in the helpful solution of present day problems confronting the nation. What greater problem is there before the public today than the matter of bettering our transportation facilities and conserving our fuel resources?

We are informed that the electrical engineer for one of the great transcontinental systems of the West has offered to place at the disposal of a representative group of electrical engineers from the section of the Institute above referred to, any data in his possession that would shed light on this problem.

In view of the importance of this problem before the public at large and before the engineering profession in particular, it is highly desirable that the West take the lead in its solution.

Data collected and analyzed by a group of engineers representing the power companies, the transcontinental railways, the telephone company, the regulating commission, the forest service, the engineering staffs of the two leading universities of the West, and the profession at large, cannot help but add a breadth of vision not hitherto attained in discussions of this important problem.

And best of all, the move in itself heralds the entrance of the engineer into a vastly broader activity than formerly attained in the profession of engineering. The great world war has proven his ability to save the nation in trying days of international carnage. Will the engineer now maintain this magnificent status and prove to be the leading factor of helpfulness in the days of vast world readjustment immediately ahead? The answer is most emphatically, yes.

THE NEW JOURNAL SERVICE: The feature of the Journal of Electricity for May 1, 1919, will be the paper of S. M. Kennedy, general agent of the Southern California Edison Company, which is to be read before the Coronado Convention of Pacific Coast Section N. E. L. A. in the session of the commercial section on Friday afternoon, May 2, 1919. We are not at liberty to announce the character or title of the paper and the Journal of Electricity will be withheld in distribution at the convention until the hour of delivery of this paper, but suffice it to say that the national reputation Mr. Kennedy enjoys in matters pertaining to the upbuilding of the industry assure our readers an unusual treat. In addition to this paper an article by W. D. A. Ryan, illuminating engineer for the General Electric Company and designer of the beautiful illumination features of the Panama-Pacific International Exposition will be contained in this issue. Complete convention discussions taking place at three Coronado conventions will appear in the Journal of Electricity, May 15, 1919.



Power House 1-A is located at the forebay reservoir above power house No. 1 and makes use of a fall in the water conduit system just above the penstock.

Automatic Induction Generator Plants

BY E. A. QUINN

(Two small power plants which make use of the water normally used in the larger plants of the San Joaquin Light & Power Corporation under heads which existed in the flow line but had hitherto not been utilized, are here described by the general superintendent of the company. The plants are operated without attendants and represent a unique development brought about by the war. The paper is part of the Engineering Committee Report for the convention of the Pacific Coast Section N. E. L. A.—The Editor.)

War time conditions, requiring such a vast amount of additional electrical energy, spurred on all Central Station companies in an effort to meet the additional demand and to forestall the threatened shortage of power. One result of this effort

From a tabulation of the flow of water through the San Joaquin conduits covering a number of years, the average yearly kw-hr. output of the Crane Valley Power House will be 3,503,000 kw-hr., and that of Reservoir 1-A Power House will be 2,948,000 kw-hr. A description of these plants follows:

Crane Valley Dam Power House

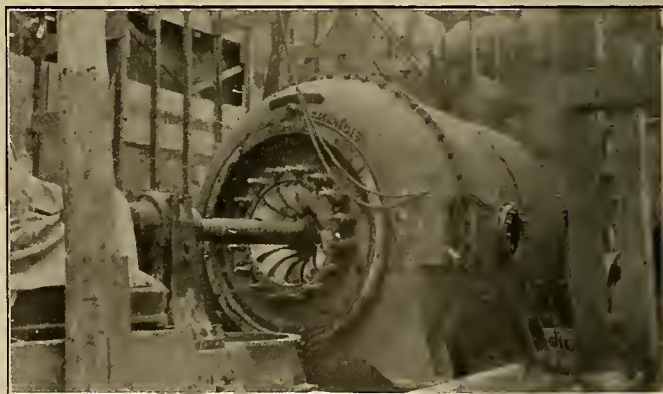
This power house is installed just below the dam, and utilizes the head of the stored water, the maximum head being 120 ft., the minimum operating head 80 ft., and the wheel designed for best operating efficiency at 100 ft. head. The water is



Power House 1-A in the course of erection. The head under which this operates was formerly unutilized.

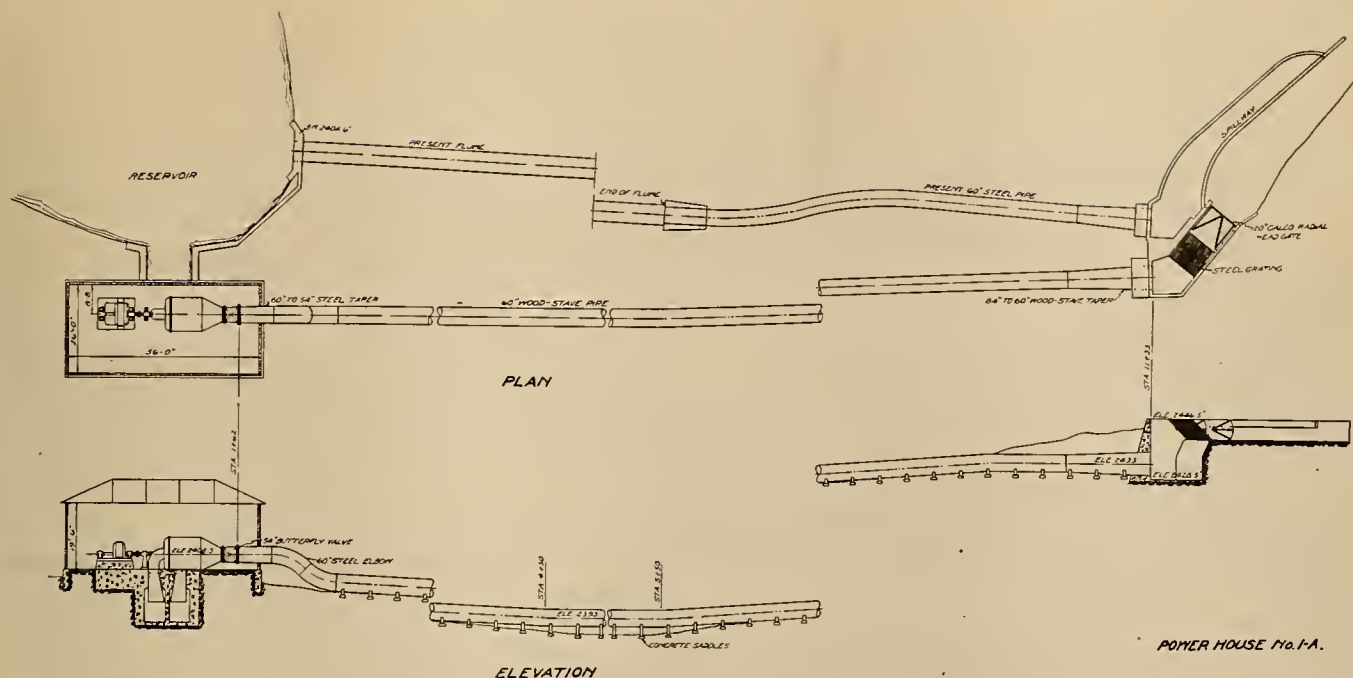
was the interconnection of the transmission systems of the hydro-electric companies in the state of California; divided into two groups, one including the group of companies in the northern part of the state and the other including the group of companies in the central and southern part of the state. Every effort was made to increase the output of hydro-electric energy, to decrease as much possible the consumption of oil for fuel. The San Joaquin Light & Power Corporation's contribution to this effort was the laying of 22 miles of 6 in. welded pipe, having a capacity of 6,000,000 cubic feet of natural gas per day, for use under the boilers at the Bakersfield steam plant, and the construction of two induction generator plants utilizing the water which is normally used through the San Joaquin River plants under heads which existed in the flow line and heretofore had not been used.

These induction generator plants are known as the "Crane Valley Power House" and "Reservoir 1-A Power House."



The 1-A turbine being set up. With an inductor generator type of station, it is feasible to utilize low heads and small amounts of water as well as to do away with governors, exciters, field rheostats and other devices which require attendance.

drawn from the lake through a gate tower connecting with a concrete lined tunnel 600 ft. long, 6 ft. high and 5 ft. wide. For a distance of 120 ft. a 48 in. steel pipe is concreted into the tunnel, the pipe tapering to 42 in. and then to 36 in., at which diameter it connects to the turbine. A hand operated 42 in. butterfly valve is installed in the 52 in. pipe. Just above the butterfly valve the 48 in. pipe is used as a manifold having 12 12 in. pipes and valves for allowing the discharge of the water into an intake basin at the head of No. 3 ditch, which permits of the by-passing of water through the ditch in the



DETAILS OF POWER HOUSE 1-A

Power house 1-A is located at the forebay reservoir at the head of the penstock for Power House No. 1. The unutilized head here was 42 ft. A forebay was constructed and a 60 in. redwood stave pipe 944 ft. long in the form of an inverted siphon carries the water to the power house.

event that the butterfly valve is closed and the power house is shut down. The power house is built directly over the No. 3 ditch, the draft tube of the unit emptying into this ditch. A gate is installed further down the ditch below the power house so that the water from the lake can be used through the power house and either taken down the natural channel or down the No. 3 ditch.

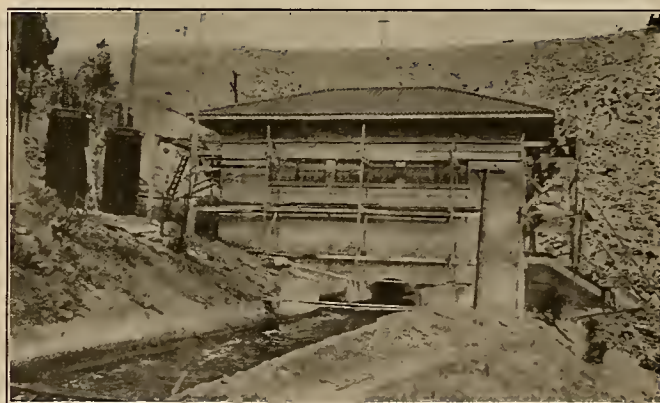


Crane Valley Power House, showing manifold discharge pipes and section of ditch. The attendant at the dam is notified by signal if the machine trips off the line, otherwise the plant receives only occasional visits.

The water wheel has a capacity of 1740 h.p., and is of the left-hand single discharge type, operating at a speed of 450 r.p.m. The bronze runner is of the mixed flow reaction type, designed to withstand the maximum runaway speed that the unit can attain under an effective head of 120 ft. The wicket gates are so shaped that they tend to close if disconnected from the hand control.

The generator is rated at 1000 k.v.a.—2300 volt, 3 phase, 60 cycles, is of the squirrel cage inductor type, and is designed for 100% overspeed. The unit is operated without a governor, but provisions have been made so that a governor may be installed should it be found desirable to do so.

The current from the generator is brought to a switchboard upon which is mounted an automatic oil switch, ammeters, voltmeter and integrating watt-hour meter. The speed of the unit is indicated by a voltmeter operated from a direct current mag-



The Crane Valley Dam Power House is installed just below the dam and utilizes the head of the stored water which varies from 120 ft. to 80 ft.

neto belted to the generator shaft. The current is stepped up through three 400 kva. oil filled, self-cooled transformers to 70,000 volts, and is carried over seven miles of line, passing through a 70,000 volt automatic oil circuit breaker where it connects to the main transmission line.

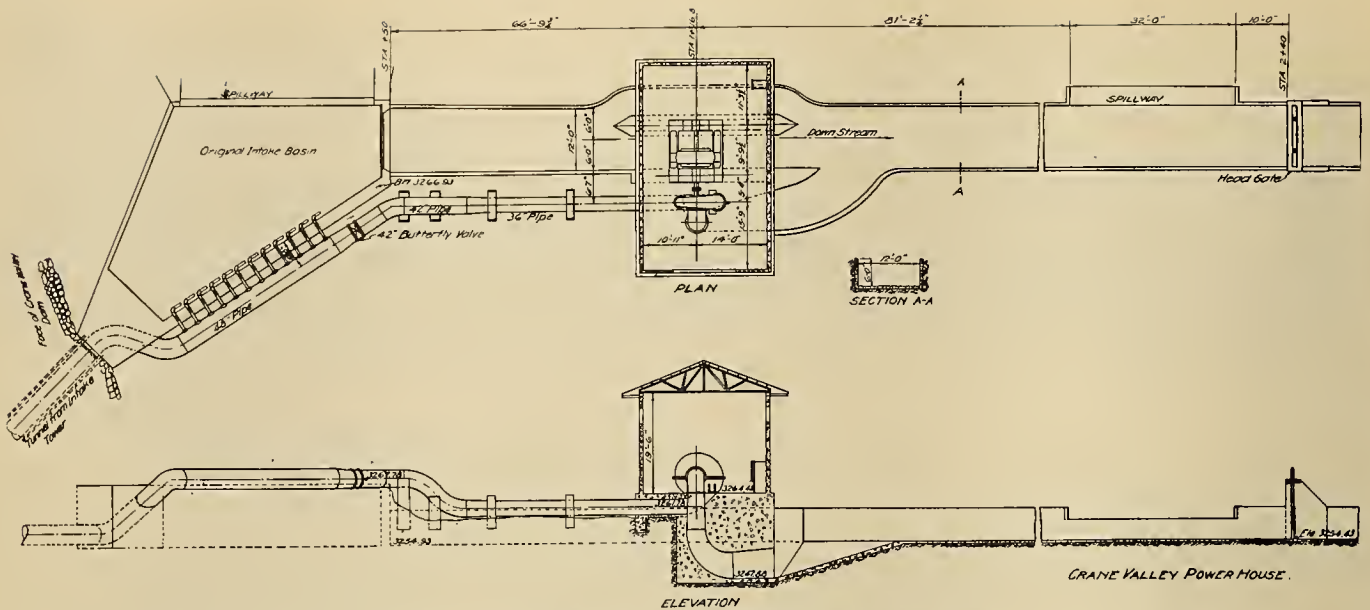
Power House 1-A

This power house is located at the forebay reservoir at the head of the penstock for No. 1 Power House. The $3\frac{1}{2}$ mile conduit which carries the water from the discharge at No. 2 Power House to



ASSALS can wait to be forced — not you

—Victory Loan



PLAN AND PROFILE OF CRANE VALLEY POWER HOUSE

This power house was constructed to take advantage of the varying head in the reservoir. The water is drawn from the lake through a gate tower connecting with a concrete lined tunnel, thence through a steel pipe to the turbine.

the No. 1 Reservoir ends at a point which has an elevation of 42 ft. above the high water level in the reservoir. The water was carried through 1100 ft. of flume from the ditch to the reservoir, and it was decided to utilize this head by paralleling the flume with pipe and constructing a plant to operate on the flow of water in the conduit.

The unit consists of a 600 h.p. end inlet single runner, double discharge, mixed flow reaction turbine operating at a speed of 240 r.p.m., the runner and shaft being designed to withstand the runaway speed which can be attained under an effective head of 39 ft. The casing is of riveted sheet steel, cylindrical in form. The wicket gates are of such shape that they tend to close if disconnected from the hand control. The turbine is direct connected to a 425 k.v.a. squirrel cage inductor type generator; 6600 volt, 3 phase, 60 cycle, designed for an overspeed of 100%. The unit operates without a governor. The current is brought to a switchboard upon which is mounted an automatic oil switch, voltmeter, ammeters and integrating watthour meter. The speed of the unit is indicated on a direct current voltmeter actuated by a magneto generator belted to the generator shaft.

At the end of the No. 1 conduit a forebay was constructed. From this forebay is taken a 60 in. redwood stave pipe 944 ft. long. It is in the form of an inverted siphon, the lowest point being 15 ft. below the center of the water wheel shaft. The staves are $2\frac{1}{2}$ in. thick and the bands $\frac{5}{8}$ in. in diameter; the band spacing having a safety factor of 5, and the bands having a tensile strength of from 55,000 lbs. to 65,000 lbs. per square inch. The upper end of the pipe is tapered through a length of 25 ft. from 84 in. to 60 in., and the connection to the butterfly valve is made through a steel pipe tapering from 60 in. to 54 in.

As the quantity of water flowing may vary from

time to time, it was found necessary to devise some means of controlling the opening of the wickets to compensate for the increase or decrease in the amount of water in the ditch. This is effected through the means of a float switch in the ditch which operates a motor on the turbine wickets in such a manner as to keep the water in the conduit at a constant level over the intake of the pipe.

An automatic spillway weir was connected in the conduit so that in case the unit is shut down the water spills over this weir and is carried to the reservoir through the existing flume and pipe line, thus by-passing the plant and eliminating any waste of water. Should the machine trip off the line and increase in speed, a centrifugal switch on the shaft of the unit closes a circuit on the wicket gate operating motor, closing the wickets and shutting down the machine. The water in the ditch immediately starts to rise, and flows over the weir by-pass until such time as the caretaker of the plant arrives and puts the machine back on the line. The float on the control operates to keep the water at a level just below the weir spilling point.

These power houses are operated without attendants, the regular dam tender and reservoir tender making visits to the plants from time to time. An alarm system is installed in the caretaker's cottage so that he is notified if the machine is tripped off the line. The machine, in the meantime, may attain runaway speed.

With an inductor generator type of station it becomes feasible to use low heads and small amounts of water power, which would not be practicable if synchronous machines were installed, requiring a complicated installation and necessitating constant attendance. With the type of power house as described above, governors, excitors, field rheostats and other auxiliary devices are eliminated, together with their consequent troubles and attendance.

Pacific Coast Practice in Insulator Testing

Report of Insulation Committee

(Pacific Coast practice in testing insulators and the conditions which affect the accuracy of the tests are here briefly described in the report of the Insulator Committee for the convention of the Pacific Coast Section N. E. L. A. The committee consists of John A. Koontz, chairman, electrical engineer with the Great Western Power Company, C. O. Poole, chief engineer of Sierra & San Francisco Power Company, and J. P. Jollyman, engineer electrical construction, Pacific Gas & Electric Company.—The Editor.)

This report is a resume of tests as used and adopted by the various operating companies of the Pacific slope together with the effectiveness of same, and a brief description of equipment and limitations of the various methods.

In the case of crew equipment no camp or cooking facilities have been included. This will, of course, have to be added in numerous cases.

High Duty Megger Testing

Equipment.—Megger having at least 1,000 volt generator and suitable scale that will detect resistance values between 2,000 Megohms and infinity and preferably 5,000 Megohms and infinity. Suitable tripod equipped with small table on which Megger can be placed and leveled. Sufficient reinforced lamp cord for connection between insulator under test and Megger. Two-prong fork with 4 ft. wood handle. Two line grounding devices and two hand lines. Total weight of apparatus 80 lbs., one light truck.

Crew.—A crew of four men, consisting of two linemen, one Megger-man and a driver have been found efficient for this work, and basing figures on an eight hour day, they will test from 200 to 700 link insulators per day, depending on the number of insulators used per string, height of towers or poles and accessibility of lines, the majority of the time being required for climbing poles or towers, together with setting up and leveling Megger. The Megger has proved itself well adapted for testing link insulators in places on the line where more than one unit is used per string, and from the records of various power companies on the Pacific Coast, as shown in Table 2, it will be seen that Megger tests can be relied upon in all but a few cases.

Limitations.—Where a single suspension unit or one-piece pin insulators are used, it is necessary to remove same from the line before testing by Megger. The parts of pin insulators having two or more shells can be Meggered provided suitable contact is made to moistened cemented surfaces on both sides of the shell. This, however, is a slow and tedious process and we do not believe has ever been used for testing units in any great number.

The high duty Megger will not give good results in foggy or rainy weather, and in general, trouble will be experienced on cloudy or humid days. When difficulty is experienced on account of damp weather, it is possible to get fairly reliable results by using the guard terminal after having properly cleaned the insulator, and in times of very severe weather conditions, the insulator can even be coated with oil for the period of testing. The time required and possibilities of not obtaining all the surface leakage current through the guard terminal places damp weather testing in the emergency class, and in general should only be resorted to for emergency conditions.

Insulators subjected to salt water spray, or to trade winds near the ocean shore, will be very difficult to megger and in general results are not very reliable. Link insulators next the wire and the tower in long suspension and dead end strings will usually show slightly lower megger reading than those in the center of the string, even though the insulators be in good condition.

The present high duty Megger will not always detect interior cracks in heavy porcelain parts which are entirely

free from moisture, but there are few localities on the Pacific Coast where the atmosphere is so dry that the cracks do not soon become moisture laden, in which case the Megger is very effective. If the voltage of the Megger generator could be raised to 5,000 volts or above, this defect of not detecting internal cracks in dry insulator caps would be largely eliminated.

Test Standard.—Any good insulator with clean dry surfaces should have an insulation resistance of from $\frac{1}{2}$ to $\frac{3}{4}$ million Megohms so that if an insulator has reached a resistance value of 2,000 Megohms or below, it should be discarded as the length of time that it might still be of some use is generally very short and not to be considered.

At times of humid weather conditions it may be necessary to carry two or three good insulators for checks when all insulators give low reading due to surface moisture.

In most places testing with Megger can only be successfully done in the daylight hours and then commencing several hours after sunrise and stopping before sunset. The actual length of time testing can be carried on will depend upon the time of year, proximity of insulators under test to water, and the humidity of the atmosphere.

The effectiveness of systematic Megger testing is shown by the records of one power company operating about 325 miles of 100,000 volt circuits. The practice is to megger all units once every two years and the places where highest depreciation is occurring, once every year.

The lines were first meggered in 1914-15, then again in 1917.

The string of failures which in general indicate service interruptions were as follows:

Prior to meggering—.05 of one per cent.

First year after meggering—.01 of one per cent. (This figure is unduly high on account of not changing all insulators at time of test.)

Third year—.06 per cent, while during 1918 the company did not lose a single string of suspension or dead-end insulators on the whole 325 miles of the line.

The majority of these link insulators were manufactured in 1907-1908, and have been in service since that date.

60 Cycle High Voltage Test

Equipment.—60 cycle source. Suitable voltage control apparatus. Transformers of ample voltage range to flash over the largest single porcelain unit or piece to be tested.

Series gap. Suitable testing racks and leads.

Crew.—1 tester, 2 tester assistants.

Limitations.—The series gap should always be used in 60 cycle testing. By observing the color and character of the arc across the gap, porous porcelain can be detected. The reddish glow of the arc in the series gap will indicate porous material while the arc will have a bluish "snappy" appearance, that of charging current, for good material.

The test standard for low frequency testing will vary depending on the material tested. Suspension insulators of the later designs should be subjected to flashover four or five times before acceptance, while the thin shells of the older pin



IM to the end — took money

—Victory Loan

TABLE NO. 1

TESTING APPARATUS		PIN INSULATORS				LINK INSULATORS			
		ONE PIECE		BUILT UP		ONE UNIT PER STRING		MORE THAN ONE UNIT PER STRING	
		Tested in Laboratory	Tested in Place on Structures	Tested in Laboratory	Tested in Place on Structures	Tested in Laboratory	Tested in Place on Structure	Tested in Laboratory	Tested in Place on Structure
MEGGER	Suitable except in extremely wet or dry climates.	Can be used	Not suitable	Can be used	Individual parts can be tested but cement must be wetted to get results	Can be used	Not suitable	Can be used	Can be used
60 CYCLE HIGH VOLTAGE	Most conclusive test.	Can be used	Not suitable	Can be used	Suitable extreme case	Can be used	Suitable extreme case	Can be used	Suitable extreme case
OSCILLATOR	Will detect defects away from cap in dry insulators. Will sometimes pass low megohm insulators.	Can be used	Not suitable	Can be used	Not suitable	Can be used	Not suitable	Can be used	Not suitable
INDUCTION COIL	Results intermediate between oscillator and 60 cycle high voltage. Detects cracks as well as porous insulators.	Can be used	Not suitable	Can be used	Can be used	Can be used	Not suitable	Can be used	Can be used
TELEPHONE DETECTOR	Will not detect between leakage over dirty insulator.	Not suitable	Can be used, limited	Not suitable	Can be used, limited	Not suitable	Can be used, limited	Not suitable	Can be used, limited

type designs should only be subjected to a voltage slightly below flashover for a period of five seconds.

We consider this method of testing the best laboratory method and it has been used in field laboratory work. One of the largest operating companies of California is seriously considering developing a low frequency test for checking insulators in place.

It is possible to detect porous shells on pin insulator without subjecting the thin parts to flashover and the possible breakage due to the power arc.

When testing porcelain with low frequency high voltage, care should be used to properly protect the test equipment against any heavy current flow or the breakage from the heat generated in the arc will be unduly high.

Oscillator Testing

Equipment.—High voltage oscillator having ample voltage range to flash over pin insulator or one unit of suspension string. Suitable voltage control equipment for handling oscillator. Alternating current voltage source. Crates for handling insulator strings or units to and from towers or poles to field laboratory. Hand lines and grounding devices. Two trucks—total weight 4000 lbs.

Crew.—4 linemen, 2 groundmen, 1 tester, 1 test assistant, and 1 truck driver.

Limitations.—Because of the size and weight of the equipment the oscillator is not adapted to use for testing

insulators in place; hence, must be used for laboratory work. This test laboratory, however, may be readily arranged so it can be transported by auto truck.

The oscillator will not detect certain classes of porous moisture laden insulators. In very dry climates where cracking is the predominant fault in the defective insulators, the oscillator will give good results.

A crew of nine men could remove, test and replace from 200 to 600 units per day, depending upon the number of units per string and the strings per tower. Insulators should stand flash over for at least a five-second period for acceptance.

Spark Coil

Equipment.—Spark coil of sufficient size and voltage range to flash over unit or part of a multi-piece unit. Ignition battery for operating spark coil. Suitable insulated leads for high voltage terminal. Two grounding devices for line equipment. Weight of equipment, 80 lbs. One light truck or touring car.

Crew.—2 linemen, 1 groundman, 1 tester and 1 driver. Can test 150 to 500 units per day in place.

Limitations.—The spark coil and oscillator are quite similar except the spark coil is of lower frequency and made in smaller sizes so that it is more portable than the oscillator. The spark coil is better adapted for testing the individual pieces of a three or four part pin insulator than the Megger. Perfect contacts with the cemented surfaces on both sides of

TABLE NO. 2.

Name of Company	Insulators					Line Data				Testing Data										Results.				
	Type	Units per String	Units per Unit	Units per Unit	Units per Unit	Span or Sag	Height	Clearance	Apparatus Used	Frequency of Impact Voltage	Scale	Megger	Standard Required for Pass Test	Where One Insulator Tested	How Often Tested	Size of Testing Crew	Buildings	Buildings	Buildings	Buildings	Buildings	Buildings	Buildings	Buildings
Southern Sierras	Link	6	1	15,500		Towers	6	Vert. 10' 8"	Oscillator & 60-Transformer	5 Sec	200,000		Flashover for period of test	in field removed from tower	1st Time	11								
San Diego Gas & El	Link	5-6	1	16,000		wood poles	3	Triangle 6' 8"	Megger in field 500-2000 in laboratory		1000	500	Remove these which vary from average 2 to 4 flashover	in place on towers	Not decided	2								
Portland Ry Lt & Power	Link	5-4-5	1	Flashover Standard		Towers	3	Vert. 6' 11"	Megger		2000	1000	2000 megs before removed 5000 megs in lab	in place on towers		5								
Los Angeles Gas & Elect	Pin Link	- 2	27,000			wood poles	3/4	8-10 Vert. 3' 4.5"	Megger		5000	1000	2000 megs	in place on poles	2 Tests have been made 1 year between	3								
Pacific Gas & Elect	Link Pin	7 - 4	10,000 to 20,000 40,000			Steel Towers wood poles	3	Vert. 10' 6.6" Triangle 6' 20"	Megger. Induction coil		2000 & 5000	1000	2000 megs 4000 megs must be removed 5000 megs standard	in place on towers in place on poles	Not decided	4								
Puget Sound Traction Lt & Power Co.	Link Pin	3 - 4	1 25,000 60,000			Steel Towers wood poles	6	Triangle 6' 10" 4-30 Vertical	Wireless Telephone Receiver					in place on towers	at least once per year	2	1%	Hydro						
Great Western Power Co.	Link	6	1 Thomas 153			Steel Towers	6	Vertical 10' 8"	Megger.		2000	1000	2000 megs	in place on towers	Every 10 years	4	0.5%	0.1%	None					

a porcelain part are not so essential with the spark coil. It will detect porous porcelain or cracks and can be used in places where weather and surface conditions would exclude the Megger.

A shunt gap is used across the terminals of the coil and the quality of the insulator is judged by the length of gap that will arc-over while insulator is under test.

Telephone Detector Tests

Equipment.—Wireless receiver head set. Battery and insulated wire. Suitable light pole, 10 or 15 ft. in length equipped with sharp metal point. Short metal rod for earth contact. In some cases a crystal detector is used to increase sensitiveness with satisfaction, and the Audion amplifier has been used.

Crew.—1 specially trained, careful lineman.

Limitations.—The telephone detector tests are generally used as a shunt circuit on the wood pole to detect leakage current to earth through the pole. The arcing and over-stressing of insulator parts give rise to high frequency currents which will give a distinctive tone in the receiver.

On wood pole construction by going to the cross arm it is generally possible to locate the pin or link string in question, but when the more sensitive devices are used in connection with short antennae on steel towers, only the tower can be determined.

The troubles with these devices are that in general you cannot distinguish between a faulty and a dirty insulator. This is particularly true if it is some of the older pin type designs in which certain of the petticoats may be over stressed due to dirty caps. Thus with many of the older design pin insulators in the fall of the year the first fog or light rain would tend to show all insulators faulty.

On account of the lightness and simplicity of this test it can be used to advantage at times if one realizes its many faults. It will in general at least indicate that the insulators are dirty and should be cleaned, and in many cases the faulty insulators can be determined while the line is in operation, which cannot be said of any of the other methods of test.

For complete details and limitations of tests see article by M. T. Crawford, A. I. E. E., vol. 33, page 1429, and article by B. G. Flaherty, vol. 35, page 1095, together with discussions.

Emergency Interchange of Power

BY G. R. KENNY

(The interconnection between the Southern California Edison Co. system and that of the San Joaquin Light & Power Corp., which united two sixty cycle with one fifty cycle system is of especial interest owing to the particularly difficult physical conditions to overcome as well as the complexities of cost adjustment. The author is on the engineering staff of the San Joaquin Light & Power Corporation. The paper is one of those presented by the Engineering Committee for the coming Pacific Coast Section N. E. L. A. convention.—The Editor.)

An example of satisfactory interconnection of systems and interchange of power under particularly difficult physical conditions is that begun in 1918 between the Southern California Edison and Mount Whitney Power and Electric Companies as one party and the San Joaquin Light and Power Corporation as the other. These companies were facing the same general power shortage conditions as those in other territory as well as a shortage of water supply for their hydro-electric plants. The generating capacity of the Mount Whitney Company which is controlled and operated by the Edison Company is entirely inadequate for the present needs of its territory, which lies in Tulare and Kern Counties, California, and is almost entirely surrounded by territory served by the San Joaquin Company.

The Edison Company operates at 50 cycles, the San Joaquin and Mount Whitney Companies at 60 cycles. The San Joaquin Company transmits at 60 k.v. and the Edison Company at 150 k.v. except south of the Kern River where they have 60 k.v. lines as well. The Edison Company has a 20,000 kilowatt, 50 cycle plant known as the "Kern No. 1," on the Kern River about fifteen miles east of Bakersfield, and the San Joaquin Company a 3,750 kilowatt 60 cycle plant known as "Kern Canyon" about two miles below on the same stream. In addition to other hydro developments the San Joaquin Company has a 12,000 kilowatt steam plant at Bakersfield and the Mount Whitney 6,000 kilowatts in steam capacity at Visalia. During 1918 natural gas was brought into Bakersfield steam plant and all boilers equipped for its use.

Conditions of Interchange

After some preliminary correspondence and conferences it was decided to interconnect the systems and begin the interchange of power with no definite understanding as to the method of settlement or how great the volume of interchange might be. The joint operation was begun in March, 1918, with the following general understanding of what was to be accomplished. "The intention is to provide a working agreement whereby use can be made by the companies of such parts of the existing resources and facilities for the production and transmission of power as are not needed at the time for the business of the owner, so long as such use and interchange can be made to contribute to the conservation of fuel and the prosecution of the war." It was also understood that settlement was to be on a cost basis. It was necessary to provide means for transferring power from the Edison Company to the San Joaquin and Mount Whitney Companies and vice versa.

In order to provide 60 cycle power the Edison Company operated as many of the four units at Kern No. 1 as were necessary for this service at over-speed and to provide 50 cycle current from the valley, the San Joaquin's Kern Canyon plant was cut loose from the 60 cycle system and operated at 50 cycles. Transformers sufficient to handle about 15,000 kilowatts were installed between the San Joa-



VOICE your thanks for victory

—Victory Loan

quin and Mount Whitney Systems at Strathmore. One of the Big Creek 150 k.v. lines was cut loose north of Magunden and used in the interconnection. In August a 5,000 kilowatt frequency changer set was installed at Magunden. The sketch shows the location of the lines used and the interconnections. All operation in connection with the interconnected 60 cycle system was under control of the San Joaquin load dispatcher at Fresno. The general operating instructions were to allow no water to waste if the power could be used to save fuel at any point and to conserve fuel at steam plants by using the most efficient steam plants first, operating at the point of greatest efficiency, etc.

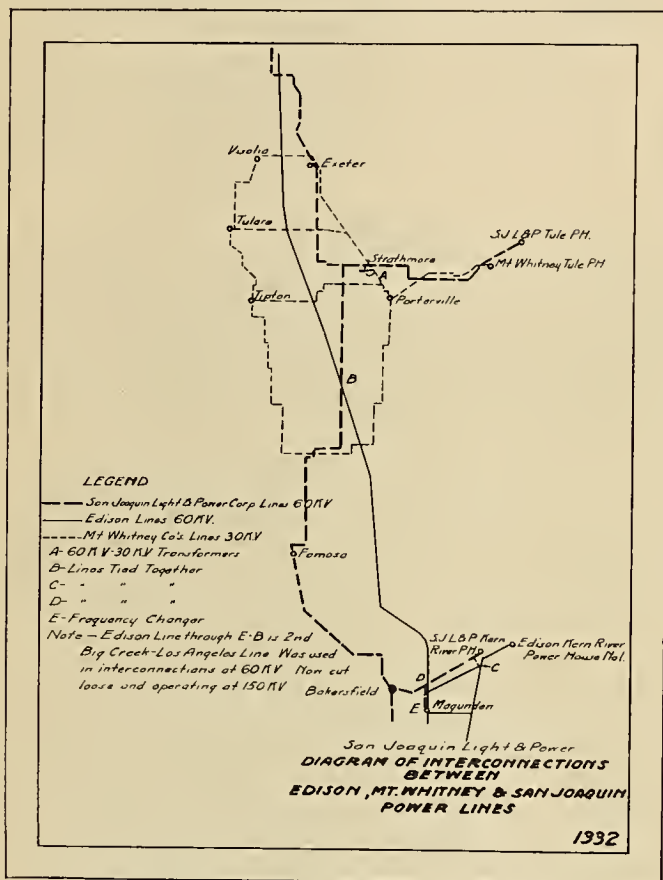


DIAGRAM OF INTERCONNECTING SYSTEMS

The location of the various elements of the interconnection is plainly indicated on this chart

Basis for Calculating Rates

The basis adopted for calculating the rates for the various classes of power to be interchanged was substantially as follows:

Power delivered from one party to the other to be paid at the "Additional Cost" of generating plus one half of any saving resulting to the receiving company as against generating at its own plants. By "Additional Cost" is meant only such expenses as would be incurred by the delivering company on account of generating the additional power in existing plants. It was understood that no additional generating capacity was to be furnished by either party for the interchange; that there was no guarantee either to deliver or receive, and that each company was to have the benefit of its own cheapest sources of power. The power to be interchanged

was considered under two classes. First: "Surplus Water Power" which was understood to mean power generated from natural flow water which could not be used at the time by the Generating Company, but could be used by the other party to save steam generation. Second: "Steam Power" delivered from any steam plant or water power delivered at such a time that it was necessary for the delivering Company to replace it by steam. All power from stored water was considered to have the same value as steam power.

It was found necessary to determine rates for "Surplus Water Power" for "Edison Oil Steam Power" generated at Long Beach and for "San Joaquin Oil Steam Power" and "San Joaquin Gas Steam Power" generated at Bakersfield. "Surplus Water Power" as defined can be produced by the generating company with no additional cost. An average cost per kilowatt hour for fuel for steam power was agreed upon and one half this cost taken as the price per kilowatt hour for surplus water power from either party to the other at any point with no line losses considered. "Steam Power" rates which were calculated for switchboard delivery on a kilowatt hour basis cover fuel costs based on the price being paid for fuel and the efficiency of fuel use shown by experience to be reasonable plus a small allowance for increase in other operating expense plus one half the saving to the receiving company against its own per kilowatt hour cost arrived at in the same way or plus a small arbitrary percentage agreed upon. These rates were of course understood to be subject to revision if the price of fuel changed. In determining efficiency of steam plants, curves were plotted between monthly output and monthly fuel use in order to determine standby use and actual operating efficiency.

Line losses under expected conditions of operation were calculated for all cases where power was to be transmitted. It was found that in transmitting the expected volume of power from Kern No. 1 over the San Joaquin System to Strathmore the line and transformer losses would average about 10%. The power delivered into the San Joaquin System at Kern No. 1 was replaced for Los Angeles by steam power from Long Beach and charged to the Valley use at the "Edison Steam" rate. The saving in line losses between delivery from Kern No. 1 and from Long Beach was offset by the loss in efficiency in operating the "Kern No. 1" machines at 60 cycles. The plant delivers only slightly in excess of 18,000 kilowatts from the water that would generate 20,000 kilowatts at 50 cycles. The output of Kern Canyon is greater at 50 than at 60 cycles. As the rates were based on cost, it was understood that the party against whom the balance for power delivered stood at the end of the year would pay to the other the amount of state gross income tax paid on account of this earning. Each company furnished and installed short sections of line, switches, and other equipment to provide the necessary interconnections. The largest items were the frequency changer set at Magunden and the transformers at

Strathmore. Where such equipment was used for the benefit of more than one of the parties, interest and depreciation were calculated upon it and together with the additional substation operating expenses incurred prorated to the parties on the basis of the benefits received by each as measured by the kilowatt hours received for final use by each. The quantities of power handled through the interconnection in 1918 are as follows:

Surplus Water Power.....	5,500,000 kilowatt hours
Steam Power.....	19,200,000 kilowatt hours
Carried over San Joaquin Lines from Kern No. 1 to Mount Whitney System.....	38,000,000 kilowatt hours

Benefits from Interconnection

The benefits derived from the interconnection may be briefly summarized as follows: The Edison Company was enabled to take care of the load in its Mount Whitney territory. The San Joaquin Company received sufficient power in 1918 to carry its load which it could not otherwise have done. A con-

siderable quantity of fuel oil was saved by the transfer of "Surplus Water Power," (Probably 25,000 barrels). Service was better protected on account of the reserve capacity available. Fuel oil was saved and operating costs reduced by the use of the most efficient steam plants.

The interconnection and interchange was carried out without friction and with the best of feeling and fullest co-operation by all concerned, and is being continued into 1919 with the same understanding as in 1918.

Although the war is over and peace conditions returning the Electric Utilities are still handicapped in new construction and most of the interconnections made are still in operation to as great an extent as during the war. The interchange of power between companies in adjoining territory should result in profit to both if the rates are properly based, as there is a direct economic saving due to greater use of generating and transmission equipment.

Relay Protective Systems

BY G. E. ARMSTRONG

(Owing to favorable climatic conditions and to the comparative infrequency of shut downs with hydro-electric generated power, the West has been backward in adopting protective methods against interruption to the service. The advantages to be gained from lines so protected and some of the methods in use on the system of the Southern California Edison Company are here considered by an engineer in the department of generation with that company. The paper is part of the Engineering Report for the spring convention of the Pacific Coast Section N. E. L. A.—The Editor.)

A great deal has been written and said about protective relays, and the market is well supplied with many ingenious devices which, when properly applied, will do almost anything that can be desired in the way of automatic sectionalization, but, comparatively little has as yet been done to get the benefits which are possible if the devices were used. This applies with greatest force to the Pacific Coast companies as those in the east have already found it necessary to take advantage of the most modern appliances for protecting their systems, due to their load requirements and the character of their transmission construction.

The West Backward

In the west there are three things which apparently have been the cause of our backwardness in this connection—our favorable climatic conditions, our generation of power by hydroelectric plants, and the fact that our transmission is largely over long overhead lines. These things combine to lessen the number of our interruptions and decrease the seriousness of the ones we have. However, this does not completely explain our lethargy and I believe the reason may be due to either one or both of the following: That the economies are not realized, or the idea is fixed that the individual systems are of such complexity that they cannot be adequately protected by any devices at present developed.

There are, of course, two reasons for applying automatic protective devices to an electrical system. These are the old stock reasons but they bear repetition. One is to make more money by giving better

service and so selling more energy, and the other is to make more money by saving that which would otherwise be spent. A momentary dip in voltage during the time between the occurrence of a short circuit and the opening of the proper switches to clear the trouble is far preferable to an interruption of such length as to permit the motor load to drop off the lines. I would not class the former as an interruption. If service were available which was subject to occasional momentary voltage dips only, there would be a very large additional incentive for some power users to change from steam to electricity. When we remember that we are selling service we will see that interruptions cost much more than appears at first glance. The power salesman has constantly to contend with the proposition that, after proving his case from the standpoint of the relative cost in dollars and cents as between private burning of fuel and the use of electrical energy from a large central station system, he has also to prove the very important point of relative reliability of the two sources of power. The consumer demands frequently that he be connected to two or more stations by two or more lines because he cannot be shown that there are such protective devices in service as will allow him to obtain the freedom from interruptions which he demands, should he be connected to only one station.



ESSELS to bring them back

—Victory Loan

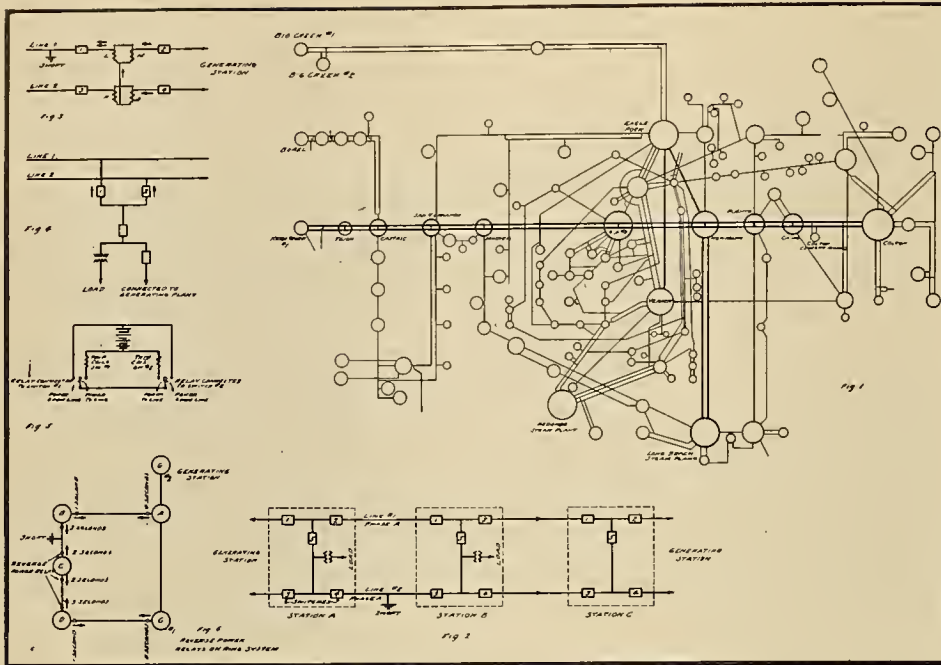


Fig. 1 represents the main transmission system of the Southern California Edison Company. The object has been to provide a substation with four sources of power. Fig. 2 shows two duplicate parallel lines through the stations A, B and C with relays which operate in case of a ground. Another application of the balanced relay is shown in Fig. 3 where the coils are placed in series with the line. A scheme of protective relays which change a station from a single line source of supply to a double line source is shown in Figs. 4 and 5. Fig. 6 illustrates the scheme of using reverse power relays for the protection of single lines which conform to the ring system.

Saving in Cost

The first point in saving in operating cost if proper protective relays are installed, is the direct reduction due to a decreased number of boilers and steam driven generators which are required as standby for insurance against interruptions caused by line failures. It is an accepted policy that standby plants should be kept in readiness to pick up the load dropped by other plants. If the number of interruptions be greatly decreased, the standby plant will show the saving immediately. This saving will be most noticeable when systems are interconnected for the exchange of surplus power. If one system is depending upon another for power and does not have to maintain a standby plant in anticipation of having to go on the line whenever a short occurs and so breaks up the interconnection, the benefits of the interchange will be most fully realized.

Another item of expense which may be made less if suitable devices are installed is the cost of patrolling lines to locate the cause of short circuits. Although this reduction in operating expense may not be very great, yet it would pay interest on the cost of a large number of relays. For example, a short occurs on a hundred mile line and may require as much as 300 miles of travel for the patrolman to cover the whole line. If the line is properly sectionalized, the location of the short will be known to be confined to a comparatively short section and the patrolling expense will be reduced accordingly.

Quite a large saving may be made by reducing line losses as in the case of duplicate lines, part of which are maintained solely for emergency use. The practice is common with many companies to operate some stations normally on one or more lines and, when an interruption occurs, to switch the stations to the emergency lines. This takes time as well as putting all of the load on part of the lines. The line losses by operating two lines in parallel as against holding one for emergency use, will, of course, be reduced three quarters and the regulation will at the same time be improved.

The question of investment saved by deferring

the construction of emergency lines has so many factors that no general conclusion may be drawn other than that it appears that two parallel lines, if of sufficient capacity, should be ample for supplying any installation at least as far as protection of the service is concerned.

Insulator Tests Avoided

Note might be made that the bugbear of insulator failures may be lessened if proper protection is obtained. Short circuits should lose a large part of their present seriousness if the defective section of line was instantly discontinued before the system was greatly affected. At present large sums are spent to detect and to remove insulators before they fail and interrupt the service whereas it may be more feasible to allow the insulators to fail in service and then remove them. This is, in a way, reverting somewhat to the obsolete theory that things should be run till they stop and then shut down to fix them, but with this change—run them till they stop and then continue to run after they stop and while they are being fixed. Part of the old policy was to "burn off" the shorts, which burning sometimes incidentally included the lines, the poles, and any other items which happened to be in the vicinity. As amended, the policy would be to let the line short but then disconnect it before damage is done. This policy is not advocated as being the correct and only thing to do, but is advanced as being a possibly less expensive method of operating. In the case of load being carried from one source only and over one line only, this policy would be wrong, but otherwise it is a question of the cost of repairs against the cost of removing defective insulators before they fail.

Choice of Methods

After it is determined that it is proper to "protect," the question is, how to do it. As was said above, the devices on the market are applicable to practically every contingency or condition which may arise in practice and they have had such trials that failure to function properly is due to selection of the wrong kind of relay, or to incorrect installation.

The selection of the proper relays is comparatively easy if the problem is analyzed to the fundamentals. It is agreed that a defective line or piece of apparatus should be disconnected as soon after failure as possible, and all that remains is to determine what are the specific phenomena which accompany the different classes of failures and select the relays that will operate due to these phenomena.

An alternating current circuit or machine, at the time of a disturbance may be subjected to, or cause, any one or several of the items following:

PHENOMENA ACCOMPANYING DISTURBANCES

1. Voltage —
 - (a) Changes as between phases, or
 - (b) To ground
2. Current —
 - (a) Increase
 - (b) Decrease
 - (c) Unbalance as between phases
 - (d) To ground
 - (e) To other circuits
 - (f) Direction of flow relatively as between two or more circuits
 - (g) Direction of flow relatively as between two points on the same circuit
 - (h) Unbalance as between paralleled circuits
3. Power —
 - (a) Changes in direction of flow
 - (b) Changes in quantity
4. Power Factor —
 - (a) Change in power factor

Certain of these phenomena, while accompanying a short circuit, will also be incidents to ordinary operation and therefore may not be used to cause the operation of relays for automatic protection. Others are functions of short circuits or other defects which are to be protected against and may be used knowing that they are infallible indicators. I wish to give special emphasis to the necessity of making some such analysis as this, since upon it will depend the success or failure of the protection system. It should also be remembered that in selecting the devices to be operated by the indications above, that it is not necessary that one single piece of apparatus should be found which will act correctly under all conditions. For example, one design of relay may be installed for one particular purpose and another entirely different kind of relay installed at the same location and be designed to get the same results as did the first relay but be actuated by different phenomena and under different conditions of operation. In fact, one installation in mind is so designed that there are three different kinds of relays all acting to open the same switches and all independent of each other otherwise.

Fitting Relays to System

One fallacy especially to be avoided is, that there is only one kind of relay available for getting certain results. Some engineers have apparently become wedded to particular types of relays and have made great effort to make their systems fit the relays. As an instance of this sort, a certain mid-western company went to considerable lengths to determine the characteristics of a specified type of relay so that they might apply such relays to their lines when, as a matter of fact, their system was admirably adapted to the use of another kind of relay which would have been much less expensive to install.

The present day tendency of overturning the established order of things may well be applied to questioning the usually accepted methods of installing certain classes of relays. It is not always neces-

sary to purchase high voltage instrument transformers for the operation of relays as potential may be obtained from the low tension side of step-down transformers and current from inexpensive bushing type current transformers. It may be possible in some cases to eliminate entirely the need of instrument transformers by placing the relays at line potential and securing remote control by means of insulated sticks. Although the cost of protective relays even if installed without taking advantage of such expedients as mentioned, is so small compared to the gain, yet it is the lack of information as to what are the costs and savings which is the wall which has held back more rapid progress along this line. In order more fully to illustrate what can be done and done at what slight expense, a number of particular instances of protection schemes will be described and their application to the system of the Southern California Edison Company outlined.

Methods in Use in Southern California

The accompanying diagram of the main transmission system of the Southern California Edison Company is shown so that one may see how the present methods of operation are being revised to follow those which will insure a still higher quality of service, and to indicate that a system which apparently is quite complex in its interconnections may be readily protected.

The first and most important scheme is to provide a substation with four sources of power in place of the single one previously had. This is obviously quite a large improvement and it is being accomplished without the construction of any additional lines and with only such changes in substation equipment as were inevitable, due to the very rapid growth in the size of the system and connected apparatus.

Referring to the diagram—Kern River Plant No. 1 is at one end of a double circuit 60,000 volt, steel tower transmission line which extends a distance of approximately 175 miles to a substation at Colton. Along this line are substations at Castaic, San Fernando, Macneil, Los Angeles, (L. A. No. 3) Newmark, Puente, Chino, and Colton Cement Works. Each of these stations is important, either in point of load supplied from it, or as being a connecting point for the receipt of power from the main generating station. For example, Castaic, in addition to supplying energy to the surrounding territory, is the terminal station of the lines connecting to the system the 10,000 k.w. plant at Borel. San Fernando supplies power to an important load. L. A. No. 3 is the main distribution station in the City of Los Angeles. Newmark is one of the main connecting points of the 47,000 k.w. steam turbine plant at Long Beach. In fact, each station is of such importance as to demand the fullest use of the facilities already at its disposal. Of equal importance with



VITAL things still remain to be done

—Victory Loan

serving the stations is the need of maintaining this 175 mile bus free from complete severance at the time a short circuit occurs. Even though there are other lines interconnecting the extremes of the system, yet, under certain conditions, if both of these 60 k.v. lines are opened at one time, a very serious interruption will follow as the system will be split into sections, part probably being overloaded and part underloaded with the usual difficulty in synchronizing them, and the necessity of dropping load to bring up the speed of the overload generators.

The past practice has been to operate these lines in parallel at three points only—namely, L. A. No. 3, Newmark, and Colton. At the other seven points the lines were not paralleled and connection was made to one line only. For example, on the Kern River end there would be two 5000 k.w. generators connected to each line. At Castaic the load would be on one line and the Borel power on the other, the stations at San Fernando and Macneil being connected to one or the other of the two lines. Thus it is seen that these substations were run from one source of energy—one line—and if a short occurred on this line, any place on its 120 miles of length, they went down for the count.

Confining Trouble to a Section

The protection plan now being installed includes operation of the 60 k.v. lines in parallel at each of the stations enumerated, and the load will be connected to the paralleling points. An equipment "balance" relays so designed that only the defective line section may trip out upon the occurrence of a short, is being installed, and will, upon completion, give these stations energy from each of the four line sections entering the station. Provision is made so that in the event of one line in a section being out for repairs, the remaining line will continue to operate under a suitable scheme of protection. The balanced relay operates upon the theory that, in a grounded Y system, there will be more current flowing in the phase which is grounded than in the similar phase on the parallel line which is ungrounded.

Referring to Figure 2, there are two duplicate parallel lines No. 1 and No. 2 connecting through the stations A, B, and C. Similar "A" phases of the two lines are illustrated. Suppose a ground occurs at the point indicated (and practically all of our shorts are grounds, although a phase to phase short would cause the relays to operate the same as described). At Station A there will be more current flowing in line No. 2 through switch No. 4 than in line No. 1 through switch No. 2. At Station B the same will occur, more current in line No. 2 than in line No. 1 as between Stations A and B. Between Stations B and C the current will be approximately equal in the two lines. From the construction of the relays used, switch No. 4 at Station A and No. 3 at Station B will immediately open and clear the short without dropping any load. The relays are simply in the case where the station is connected to another source of power, as indicated by the dotted lines, the reverse relays must be of the double contact two similar solenoids mounted with their plungers

suspended from the ends of a lever similarly to the pans of a balance. The solenoids are energized from bushing type current transformers in the line switches. The current in phase A of line No. 1 being balanced against the current in phase A of line No. 2, etc. It is obvious that with more current flowing in A phase of line No. 2 than in A phase of line No. 1 that the solenoid connected to line No. 2 will exert a stronger pull on its plunger than the other solenoid on its plunger and so cause a deflection of the balance arm closing contacts which energize the trip coil of the respective switch.

Another application of the balanced relay is to place the coils in series with the line as shown in Figure 3. This form of relay is the simplest and cheapest which can be constructed and at the same time gets very good results indeed. The solenoids are placed directly in the line and are wound with wire of ample current carrying capacity. The contacts are closed by the movement of a wooden rod connected to the balance arm and having sufficient length to insulate against the line voltage.

With a short on line No. 1 current will flow as indicated by the arrows and there being more current through coil L than coil M, will result in a deflection of the balance arm toward coil L and so cause the switch No. 1 to trip open. Depending upon the distance of the short from the station shown, the current in coils N and O may be of such relative magnitude that switch No. 4 may also trip open. This may, however, be immediately reclosed and no interruption be caused by its having opened, as switches No. 2 and No. 3 have remained closed. An installation of such series balanced relays has been in successful operation for months and no failure has been experienced except incidental ones caused by improper care.

Double Line Protection

A scheme of protective relays which changes a station from a single line source of supply to a double line source is illustrated in Figures 4 and 5. In many instances a station is arranged so that it may be connected to either one of two lines and be normally connected to one line with orders to switch from one line to the other should the first line become shorted. This, of course, takes time and causes the station to be dead during the interval. The alternative in the past has been to close the switches to both the supply lines and depend upon the automatic overload relays to trip out the defective line with the result that both lines usually trip out. Figure 4 shows a station wired as indicated.

The switches No. 1, connecting to line 1, and No. 2 connecting to line No. 2 are under the control of reverse power relays so wired that power flowing toward a line will trip the switch connecting to that line. Thus if a short occurs on line No. 1, power will flow from line No. 2 through switches No. 2 and No. 1 to line No. 1 and cause switch No. 1 to open leaving the station connected to the good line. type. That is, they will close one contact when power is flowing in one direction and another when power is flowing in the opposite direction. The con-

nections for this scheme are as in Figure 5 and the relays act so that power flowing in the same direction in both switches will not trip out either, but if power flows in one direction through one switch and the opposite direction in the other, the switch through which the power is flowing to the line will trip out.

Better Systems of Protection

The scheme of using reverse power relays for the protection of single lines which conform to the ring system is another variation of the possibility of transforming a substation from one having a single source of energy to one having a double source. This scheme is to install at each station reverse power relays set to close their contacts when power flows as shown by the arrows in Figure 6. The time elements are arranged so that successive relays are set with sufficient intervals between adjacent relays as required for the opening of the switches. In the figure a short circuit is assumed as indicated. The relays having the arrows pointing along the line toward the short will start to close their contacts and at Station C the relay on the line between Station B and C will cause its corresponding switch to open. At Station B the switch on the faulty line section will open and cause the final disconnection of the fault without having allowed any station to be without power. The absolute values of time for which the relays must be set have to be determined by tests of the switches and should also be considered in relation to the setting of other relays on the system. This system of relays is the only one which will accomplish the desired result

without the expense of running pilot wires between the stations and is also very inexpensive as compared with the latter method.

The pilot wire system has its application between stations situated within a short distance of each other and when the relatively long minimum time setting required by the reverse power relay scheme would be undesirable. Another application to be made of the pilot wire system is in stations for protection against trouble within the stations. This plan completes any of the plans mentioned, but is not a necessary adjunct to them. As installed the scheme will consist simply of two current transformers in each phase of each line—one where the line enters the station and the other where the line leaves the station. The secondaries are connected in series with an overload relay shunted across them. This relay would only close its contacts when there was a short within the station. For simplicity in construction this relay would act, in a station such as illustrated in Figure 2, to open switch No. 5 and so leave the short on one of the main lines and cause the opening of switches, on that line at the adjacent stations. By this means one of the main lines would remain closed throughout and an extended interruption be avoided.

These few examples of the protection plans of the Southern California Edison Company are given simply as illustrations of what may be accomplished and are not by any means a complete index of this subject. Other schemes using other relays serve their purposes and have been described many times in the past.

Converting a Steam Plant to Stand-by Operation

BY L. M. KLAUBER

(The tie-in of the San Diego Consolidated Gas & Electric Company and the Southern California Edison Company at Capistrano necessitated the changing over of the steam plant at San Diego to a stand-by plant with consequent problems in the turbine and boiler rooms, the solution of which has brought out several developments of interest. The paper forms part of the Engineering Committee's Report at the coming Pacific Coast Section N. E. L. A. convention. The author is superintendent of construction with the San Diego company.—The Editor.)

It is the purpose of this paper to enumerate some of the minor problems which were met in converting a steam-electric generating plant to stand-by operation, following a tie-in with transmission service. While problems such as these are of a secondary character and necessarily differ in individual plants, it is thought that a brief description of what was done in one plant may lead to a discussion and interchange of experiences which should be of value.

The San Diego Consolidated Gas & Electric Company is interconnected to the system of the Southern California Edison Company by a 60 k.v. 50 cycle line 30 miles long, from Katella Substation to San Juan Capistrano, and a 70 k.v. 60 cycle line, 76 miles long, from Capistrano to San Diego. These two lines are connected through a 6250 k.v.a. frequency changer set at Capistrano. At the San Diego end the step-down transformer bank is rated at 6000 k.v.a., 66-12 k.v. Energy was formerly steam-generated at San Diego at 2400 volts, the close-in distribution system being fed directly at this voltage,

while the surrounding territory is furnished with energy at 11 k.v. The 2400 volt busses are connected to the 11 k.v. busses through 3 banks of transformers, totaling 6000 k.v.a. Thus it will be seen that there are two transformations interposed between the local generators and the transmission line. The steam equipment at San Diego includes 6194 h.p. of B. & W. water tube boilers; and turbines and engines totaling 11,750 kw., of which the more modern units are 1-2000 kw. and 2-4000 kw. General Electric horizontal sets.

As a stand-by steam plant is operated primarily for the betterment of service, either as to continuity or regulation, there is more latitude in the schedule of operations than exists in a plant producing en-



IGOR will finish the job

—Victory Loan

ergy. Necessarily, this schedule will be determined by the quality of service received from the transmission line and the degree to which that service must be improved before it is passed on to the customer. Having once determined upon a schedule of operations, it remains to secure the result as safely and economically as possible.

Times and Conditions of Heavy Load

Prior to the time of the completion of the tie-in with the Edison Company practically all of the en-

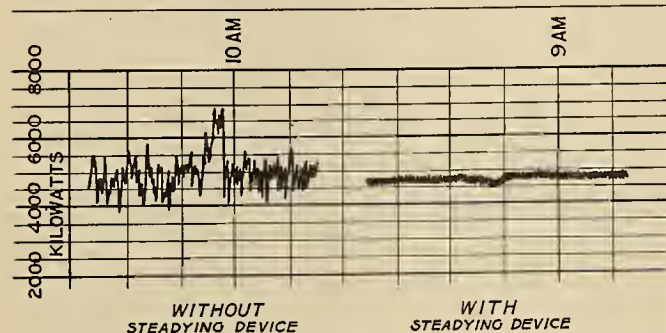


FIGURE 1
EFFECT OF GOVERNOR STEADYING DEVICE ON
WATTMETER CHART

One of the problems encountered was the difficulty of maintaining a proper load division. Load sweeps of from 1000 to 2000 k.w. occurred continuously. This was eventually remedied by the device shown in Fig. 2.

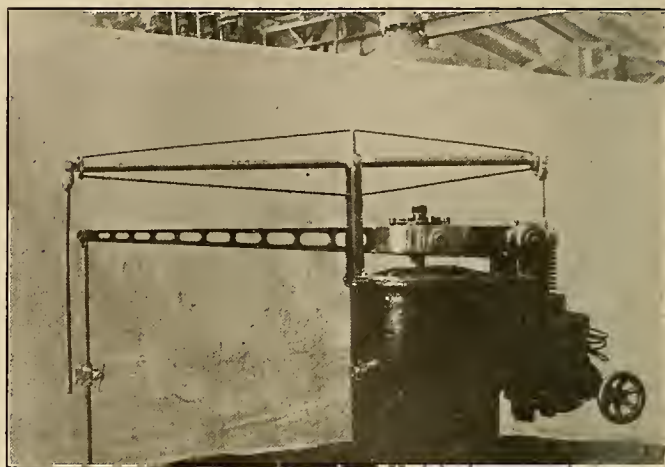
ergy used by the San Diego Company was steam generated in the San Diego plant. Subsequent to the tie-in the load factor requirements of the contract covering the purchase of energy and the limited capacity of the connecting frequency changer, necessitated the generation of about 15% of the total energy required by the steam. The bulk of this 15% is required over the evening peak; however, during the dry season when the irrigation load is on, some energy must be produced throughout the entire day. Thus it is necessary to operate a turbine for energy-producing purposes each evening, and for a part of the year, during the day load. The first problem in connection with stand-by operation was to decide as to the dependence to be placed on transmission service, and whether sufficient generators should be floated at all times to enable the entire load to be picked up immediately. After due consideration and the development of experience with the hitherto untried transmission line, the following schedule was adopted:

A 4000 kw. turbine capable of carrying 5200 kilowatts is floated daily except between midnight and 6:30 A. M. This permits the immediate assumption of from 85% to 100% of the day load and from 60% to 70% of the night load. On Sundays and holidays no machine is floated until 11:00 A. M. At times of storms or other uncertain line conditions, sufficient units are floated to carry the entire load. The location of the frequency changer at Capistrano gives the San Diego Company an independent voltage control which betters the ordinary transmission service and renders it unnecessary to float a turbine strictly for regulating purposes. However, it is of course true that it is often desirable,

entirely aside from consideration of continuity, to float a turbine in order to reduce line loss.

Failure When the Turbine is Dead

On the whole, the service secured from this schedule of operations is satisfactory, although not so good as that which was rendered before the tie-in. After midnight, when the floating of a turbine appears to be unjustified either for continuity of service, regulation or reduction of line loss, it is necessary to start a turbine from rest to pick up the load in case of failure. By means of close co-operation in the operating force and the installation of the several operating methods described below, we have found that we can put a dead 4000 kilowatt turbine



GOVERNOR STEADYING DEVICE

At first a beam was fastened to the turbine frame and clamped to the rod connecting the governor lever to the floating lever of the pilot valve. The load could not be regulated from the switchboard gallery however, and eventually this device was worked out.

on the line and pick up full load within three minutes after transmission service has failed. This is accomplished by two men in the engine room, the operating engineer and the assistant engineer.

In order to interfere as little as possible with the more exacting types of customers, schedules were made showing the order in which feeders should be dropped to carry immediately all the load. At times when the transmission line trips out at Capistrano the transmission line itself is always the first feeder dropped (the line acts as a feeder in carrying the company's north district load through a step down station at Oceanside), since the Edison Company is usually attempting to come in again at once and can thus pick up this part of the load without synchronizing.

Steadying the Turbine Governors

Some of the mechanical problems of interconnection developed immediately the two systems were tied together. As our operating schedule requires that the transmission line be loaded to the capacity of the frequency changer at all times when the total load exceeds this quantity, it is desired to regulate the load on the turbines very carefully and for long periods over the day load it is necessary that the turbine operate at but a fraction of its rating. No difficulty was experienced in synchronizing and tying the two systems together, but when an attempt was

made to follow the schedule above outlined, it was found impossible to maintain a proper load division, even with the constant attention of the operator. The turbine governors appeared oversensitive and load sweeps of from 1000 to 2000 kilowatts occurred continuously at intervals of less than one minute (Fig. 1). It was seen at once that some steadying device would have to be applied to the turbine governors. The first device experimented with consisted of a beam fastened to the turbine frame at the lower end and clamped at the upper end to the vertical rod connecting the governor lever to the floating lever of the pilot valve. The clamp, faced with leather, was arranged to slip on the connecting rod, the friction of the grip being regulated by adjusting screws. By this means the small movements of the governor were prevented and the load on the turbine steadied. However, this device had the serious disadvantage that load could not be regulated from the switchboard gallery, for if the electrical governor control were operated too large a movement was required before slippage occurred. Consequently it was necessary for the man on the floor to manipulate the load on signal from the operator; a very objectionable condition. This difficulty was entirely obviated by the invention by one of our operating engineers of the load steadying device shown in Fig. 2. This consists essentially of a rigidly trussed beam which parallels the governor beam, the pivot point being anchored to the frame, one end being connected to the base of the synchronizing spring, and the other end being attached to a leather faced clamp which grips the rod connecting the governor beam to the floating lever. The clamp is fitted with proper adjusting screw for varying the friction and also with a release so that it may be quickly disconnected by a half turn of the adjusting screw. This device has given excellent results. The turbine load is easily adjusted by quantities as low as 50 kilowatts with the ordinary governor control from the gallery. The load fluctuations are reduced to a minimum, as shown in Fig. 1. The device does not prevent the turbine from picking up load instantly when the transmission line goes off, and there appears to be no dangerous tendency to overspeed when load is unexpectedly dropped.

Cooling the Blading

In connection with floating turbines it was of course necessary to provide sufficient steam to cool the blading. In order to determine what quantity would be required and to secure safety of operation, a Bristol recording thermometer was installed on each turbine, the temperature element being inserted in the last diaphragm. The rules of operation require that sufficient steam be admitted to keep the temperature at this point below 250 degrees F. at all times. It was found that on two of the turbines sufficient steam leaked through the controlling valves and packing to keep the temperature below this point. On the third turbine it was necessary to bypass the controlling valves. A $1\frac{1}{4}$ inch pipe was first tried, but this does not pass enough steam to keep the blading below the required temperature when

floated for long periods, and it is therefore necessary to admit steam at intervals through the controlling valves. This is done by operation of the governor control, the turbine being operated with a very slight load for about half an hour, which quickly brings the temperature down. It is probable that the size of the by-pass will be increased so that the machine may be floated indefinitely. It might be noted that the leakage of a small quantity of steam past the

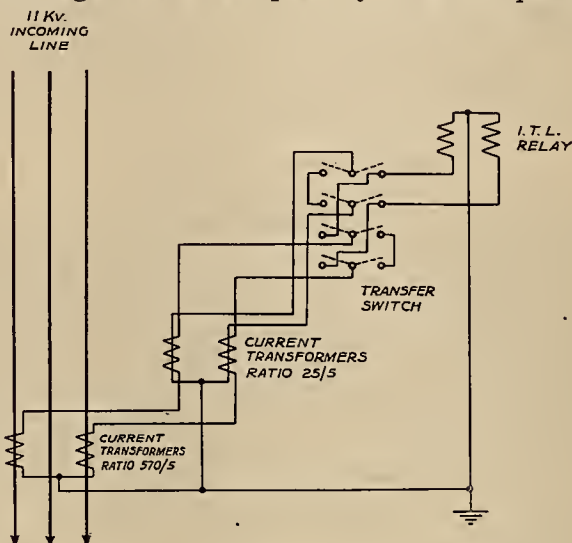


FIGURE 3

TRANSFER SWITCH FOR VARYING
RELAY SETTING

Serious disturbance was met with in testing the transmission line, but a double throw transfer switch with two additional current transformers was installed which quickly cut the setting of the relay to a light load position.

control valves appears to be a benefit in a stand-by plant, as it enables the starting of a dead turbine quickly with avoidance of expansion difficulties that might otherwise occur.

Schedule of Operation

The schedule of operation of turbine auxiliaries in a stand-by plant requires some deviation from the practices of normal operation. As no storage battery was available in this plant it was decided to keep a steam-driven exciter in operation at all times, not only for excitation in case of transmission line failure, but also to furnish emergency plant lighting and energy for the switchboard control circuits. As to the condenser equipment, it appears best to operate with the best possible vacuum on the turbine when floating. Naturally, less circulating water is required at such times, but determinations of the energy required for the operation of the circulating pump with discharge partially closed did not appear to warrant throttling, especially as these pumps are not equipped with electrically operated valves. However, one economy was effected by cross-connecting the circulating pumps of the three turbines. When all turbines are shut down, the steam driven circulating pump on the 2000 kw. turbine is operated to



VIGILANCE is needed

—Victory Loan

circulate water through the condenser of the most economical of the 4000 kw. turbines, which is equipped with a motor-driven circulating pump. Thus, by means of this small pump we are aided in getting a quick start on the large turbine, as the small pump not only keeps the circulating system primed, but furnishes sufficient water so that it is unnecessary to start the pump belonging to the turbine until the unit is brought to speed and carries full load. When all turbines are shut down no auxiliaries are kept running, but the exciter and the small circulating pump, and all are started in the three minutes within which the turbine is put on the line.

Modifications in Practice

Some difficulty was experienced with the motor-driven circulating pump of the larger turbine, as the low voltage release caused it to drop out whenever the transmission line went off, due to the fluctuation in the voltage before the turbine picked up the load. This was corrected by the installation of a home-made oil dash pot on the low voltage release, which may be recommended as a cure for similar difficulties on important motor installations. The low voltage release will not hold in long enough to cause the motor to be injured if the energy is off more than momentarily.

These turbines are equipped with one of the usual forms of boiler room indicators, which show by rows of colored lamps the number of valves open on each turbine. It was necessary to modify slightly this device so that the first lamp would be lighted, not at the opening of the first valve, but whenever a turbine is operating, so that it thus indicates the floating condition. In connection with the floating of turbines, non-reversing devices were placed on all of the generator watt-hour meters, so that the current consumed by these generators when motoring would not be considered as a deduction from current generated, but would rather be observed in the unaccounted for distribution losses, which would seem to be proper accounting.

Testing the Transmission Lines

One of the problems which had to be met was in connection with the testing of the transmission line. As the incoming line circuit breaker is ordinarily set to trip at 12,000 kw., it is evident that testing with the switch so set would cause serious disturbance on so small a steam plant. This problem was solved by the installation of a double throw transfer switch as shown in Fig. 3, which by the use of two additional current transformers, quickly cuts the setting of the relay to a light load position approximately $1/5$ of its normal setting. This setting is also useful when no energy is being received from the Edison Company, and the transmission line is utilized as a feeder to carry the San Diego Company's northern district.

Naturally, whenever a turbine is operating, either floating or carrying a load, an endeavor is made to reduce line losses by running with the power factor on the transmission line close to unity. As a constant voltage is desired at the receiver end, it is

necessary to vary considerably the voltage of the frequency changer generator to compensate for different receiver loads and power factors. The calculated regulation curves of the transmission line were drawn up for a variety of loads and power factors to give the operators at Capistrano Substation an opportunity to regulate to a constant receiver voltage. These regulation curves were found to be considerably in error when checked against actual line operation, but the Edison operators soon became sufficiently familiar with the necessities of the service to come very close to constant voltage at the receiver, either with or without a turbine running.

Problems of the Boiler Room

The boiler room offered some interesting problems in the quick generation of steam and in stand-by economies. As this plant furnishes steam to an adjacent gas plant and ice plant (although in a far less quantity), the problem was somewhat different from that of the ordinary stand-by plant. Klaxon signals operated from the switchboard gallery were at once installed in the boiler room and at various points in the gas plant at which steam is consumed. By means of one long blast on this signal system, notification is given of the failure of the transmission line and the gas plant steam consumption is instantly reduced to a minimum, which aids materially in securing sufficient steam to pick up load. To aid in starting additional boilers quickly, gas pilots were introduced and proved quite successful. In other boilers which ordinarily burn tar over a lamp-black fire (which runs the boiler far under capacity) arrangements were made to introduce oil into the tar burners, this being atomized with compressed air, as it is difficult to get sufficient air through a lampblack fuel bed to burn oil over it. This made it possible to secure full load from a pair of boilers which under normal operation operate at barely one-third of rating.

It was early seen that quick assumption of load transmission line failure was a more difficult problem in the boiler room than in the turbine room, and it was therefore decided to install the Merit Automatic Stoker System on six of the boilers, totaling 3280 h.p. This system has been installed but a short time, but thus far has been successful both in improving the stand-by economy of the plant and the rapidity of steam generation. In order to compensate for pressure drop in the steam lines between boilers and turbines, the control pressure is tapped at the turbine, which gives a much closer regulation. At present with two boilers operating at about $1/3$ load on lampblack, furnishing steam for the gas plant, and enough boilers on pilot fire to carry full load, full load will be picked up on a turbine practically instantly, and with only a momentary drop of 5 pounds in steam pressure on the recording pressure chart.

Before the Merit Stoker System was installed considerable judgment was necessary on the part of operators in bringing in a second turbine, since, as the capacity to deliver steam quickly was the limiting factor, if a second turbine were brought in too

quickly, the steam taken by this machine and its auxiliaries at starting would reduce the load which the running turbine might carry.

Regulation of the Water Supply

After the tie-in it was necessary to give consideration to the question of fresh water economy. Naturally, the balance which had existed under pure steam operation was modified; the amount of fresh water required for make-up water was materially reduced and at the same time the addition of water-cooled step-down transformers added to the quantity required for cooling purposes. In consequence there was a surplus of fresh water in spite of efforts made to cut to a minimum the amount going to the transformers and the turbine bearing cooling coils. After an investigation of various schemes, including the installation of a cooling tower, or the procuring of circulating water from an adjacent gas holder tank, it has been decided to circulate salt water through the turbine bearings. This scheme will shortly be placed in operation and it is believed no deleterious results will follow. An automatic pressure valve will be installed so that upon failure of the salt water

supply, fresh water will automatically flow into the coils. A salt water cooled oil cooler is likewise to be installed on one of the turbines to still further reduce the water required in the bearings. If this is successful in conserving oil and water by a reduction in the bearing temperature, the other turbines will be similarly equipped.

Some difficulty was experienced in maintaining a proper balance in the exhaust steam for feed water heating under the new conditions of operation, and it has been necessary to exercise greater care in returning all of the exhaust steam available for this purpose to secure the desired result.

Plant Efficiency Raised

In conclusion it may be noted that the installation of the various methods and devices described has not only improved continuity of service, but has raised the plant efficiency (when on stand-by service) from about 80 to 105 kw-hr. per barrel of oil. The efficiency of this plant before the tie-in when generating all of the energy required by the company was from 212 to 220 kw-hr. per barrel of oil, depending on the load factor.

The Use of Pulverized California Coal

BY CHAS. H. DELANY

(The high price of fuel oil and the available supply of lignite coals in the West combine to interest western power men in the use of pulverized coal. The question of its economical employment as a substitute for fuel oil is here discussed from the standpoint of initial costs and comparative operating expense. The author is steam power plant specialist for the Pacific Gas & Electric Company and the paper is one of the group presented by the Engineering Committee for the coming Pacific Coast Section N. E. L. A. convention.—The Editor.)

Among the advantages of burning coal in pulverized form, the one that stands out above all others is the fact that no matter how poor the coal, it can be burned in pulverized form with good efficiency. This fact makes the use of pulverized coal especially attractive for California coals, which are low grade lignite. With high grade coals such as are obtained in the Eastern States, the development of stokers has made it possible to secure excellent boiler efficiency. There has always however been great difficulty in obtaining good efficiency with low grade bituminous coals and lignites. These coals having high ash content and high percentage of volatile matter are difficult to burn efficiently due to the difficulty in bringing air in contact with all particles of the combustible. This is due to the fact that the ash surrounding the particles of coal keeps the air away from the latter resulting in a considerable portion of the fuel becoming mixed with ashes. Besides this, the volatile matter does not thoroughly mix with the air so that the combustion of the gases is incomplete unless a large amount of excess air is admitted, this resulting in poor gas analysis.

When coal is used in pulverized form it is ground down to such a size that 95% will pass through a 100 mesh and 85% through a 200 mesh screen. These particles are so small that air surrounds every particle of coal, making it impossible for any particle to reach the ash pit without being burned. This mixture of air and combustible continues in the combustion chamber so that as soon as

the volatile matter is distilled off from the coal, it finds itself in contact with the air necessary for its combustion. The result of this is the ash is absolutely free from combustible matter and a gas analysis showing high CO_2 with very little excess air.

Coal Fields in California

There are four coal fields in California from which coal has been produced in commercial quantities, although the production has been reduced to little or nothing since the advent of fuel oil. The present scarcity and high price of oil are reviving interest in these coal fields. They are:

The Ione Coal Field, between Ione and Carbondale in Amador County.

Mount Diablo Coal Field near Pittsburg, Contra Costa County, in which the Black Diamond Mine is located.

Priest Valley Coal Field near the Junction of Fresno, San Benito, and Monterey Counties in which the Stone Canyon Mine is located.

The Corral Hollow Coal Field in Alameda County in which the Tesla Mine is located.

Coal has also been found to a considerable extent in Mendocino, Shasta, Siskiyou and Trinity Counties and there are indications of its existence in ten other counties. In none of these however has there been any commercial production. The follow-



ICTORY was their contribution

—Victory Loan

ing gives approximate analysis of coal obtained from the four principal fields enumerated above:

	Ione	Mount Diablo	Stone Canyon	Tesla
Moisture	22.44	7.9	6.2	8.0
Volatile Matter	43.37	41.6	46.9	51.1
Fixed Carbon	20.41	37.4	39.6	33.8
Ash	14.73	13.1	8.3	7.1
Sulphur	2.98	6.03	4	2.4
B.t.u. per lb. (as received).....	9,322	10,010	12,300	19,230
B.t.u. per lb. Dry.....	12,016	10,880	13,000	11,126

It will be noted from these analyses that in all cases the volatile matter is in excess of the fixed carbon. This relation immediately classifies these coals as lignites and consequently the same difficulty may be expected in burning them efficiently as is common to all lignites, so that the advantages of using them in pulverized form are apparent.

Value Compared With Oil

By a study of the foregoing analyses it is possible to determine approximately the value of coal compared with oil. The analyses show a considerable percentage of moisture, and before the coal can be pulverized this moisture must be driven off in a drier. Taking the analysis of Mount Diablo coal for example, one ton of coal containing 2000 lbs. with a moisture content of 7.9% would require 30 lbs. of coal in the drier to drive out the moisture. Besides this the weight of moisture itself amounting to 158 lbs. must be deducted, so that the net weight dry coal delivered to the boilers from one ton of coal as received would be 1812 lbs. As each pound of dry coal has a heating value of 10,880 B.t.u., the total heat units obtained from a ton of coal would be $10,880 \times 1812 = 19,700,000$ B.t.u.

No tests have been made of California coal burned in pulverized form, but tests made in Seattle on coal of similar quality show efficiencies running from 70 to 77%. Assuming a boiler efficiency of 75%, the heat absorbed by the boiler per ton of coal would be 75% of $19,700,000 = 14,790,000$ B.t.u. A barrel of fuel oil containing 336 lbs., each pound having a heating value of 18,300 B.t.u. would have a total heating value of 6,150,000 B.t.u. Many tests of oil burning boilers have shown efficiencies as high as 80%. Taking this figure the heat absorbed by the boiler per barrel of oil will be 80% of 6,150,000 = 4,920,000 B.t.u. Since this is almost one third of 14,790,000, it is obvious that one ton of coal is equivalent to three barrels of oil.

To determine the price at which the coal could be used to correspond with a given price of oil, it is necessary to allow for the expense of drying, pulverizing and handling the coal. The equipment required for this purpose including the building, bunkers, driers, pulverizing mills, feeders, burners, conveyors, and elevators, costs approximately the same as the boilers themselves. In other words a boiler plant complete with pulverized coal equipment would cost twice as much as the same boiler plant equipped for oil burning. This high cost of equipment required for pulverizing coal means a considerable annual expense due to fixed charges alone. Besides the fixed charges, other items entering into the annual cost are labor, power and repairs, and it is found that the total expense involved in the use of pulverized coal amounts to very nearly \$1.00 per ton.

This is on the assumption that the plant is operated at full load. If the plant is operated at light load the fixed charges and labor costs per ton increase so that the total costs may run as high as \$1.50 per ton.

Since three barrels of oil are equivalent to one ton of coal, it is a simple matter to determine the comparative values of the two fuels. In the following table the price of coal is given corresponding to price of oil from \$.60 up to \$2.00 per barrel. Two columns are given for the prices of coal, one being the equivalent price of pulverized coal delivered to the boilers, the other being the equivalent price of raw coal delivered to the plant, allowing \$1.00 per ton for the cost of handling and pulverizing.

Price of Oil per Barrel	Price of Pulverized Coal Delivered to Boilers per ton of raw coal	Price of Raw Coal Delivered to Plant per ton
\$.60	\$1.80	\$.80
.80	2.40	1.40
1.00	3.00	2.00
1.20	3.60	2.60
1.40	4.20	3.20
1.60	4.80	3.80
1.80	5.40	4.40
2.00	6.00	5.00

This table is favorable to coal owing to the fact that it is assumed that the plant would operate at full load. If the plant is to operate at a light load factor, proper allowance must be made for the additional cost per ton of pulverizing. The actual price at which coal can be delivered to a plant is indefinite and depends on the location of the plant, cost of coal production, freight rates, etc.

The above table will enable a determination to be made as to the relative values of the two fuels in any particular case in which the price of coal is known. For coal to compete with oil at \$1.60 per barrel it must be delivered at the plant for \$3.80 per ton or less, but in order to compete with oil at \$1.00 per barrel it must be delivered for \$2.00 per ton. While the former figure might be reached, the latter figure does not seem possible, and it is obvious that the question as to whether it would pay to change from oil burning to coal burning depends largely on what the future prices of oil are likely to be.

The Plant at the Mine

The possibility of building a plant at the Coal Mine and transmitting the electric energy to its point of use, has many attractive features. A special investigation would be required in each case. Some of the questions involved would be:

The water supply at the mine, the distance the power would have to be transmitted, involving the cost of transmission line, the transmission losses, etc. Some of the mines in the State have practically no water supply and in some cases it may be found best to locate the plant at some point between the mine and the point at which the power is to be used. Another possibility is the building of the drying and pulverizing plant at the mine and shipping pulverized coal to large and small consumers. This is now being done on a limited scale in Seattle, and it has been found feasible to ship pulverized coal in tank cars. This will enable a single pulverizing plant to operate at high load factor and to supply coal to a number of diversified existing plants. In this con-

nection it may be said that the storage of pulverized coal is a problem still to be solved, as spontaneous combustion is liable to occur if the pulverized coal is allowed to stand for more than five to fifteen days. Where continuity of service is essential in a pulverized coal plant, it is desirable to have the plant equipped with oil burners as a standby. This is because the handling of the coal involves so many elevators and conveyors, and the breaking down of one link is liable to shut down the whole plant.

Still in Experimental Stage

In conclusion it may be said that the burning of pulverized coal under boilers is still in the experimental stage. It has been proved, however, that it is possible to burn it, and it is probable that within a few years the design of equipment will be standardized and simplified so that its cost will not exceed the cost of stoker equipment.

Pulverized coal has the advantage that it is possible to obtain a higher efficiency with it than is usually obtained with stokers, especially where low

grade coals and lignites are burned. It has the further advantage that coal of any kind can be burned, even sludge and mine refuse containing as high as 35% of ash.

Little trouble may be anticipated due to dust explosions provided the pulverized coal is confined. Any leak in a pipe conveying pulverized coal should be stopped, and as much care should be taken to prevent leaks as would be taken in the case of gas.

One objectionable feature of a pulverized coal plant is the dust that is discharged both from the driers and from the smoke stacks. On this account it would not be advisable to install a pulverized coal plant in any locality in which dust would be objectionable, such as a residence district in a city.

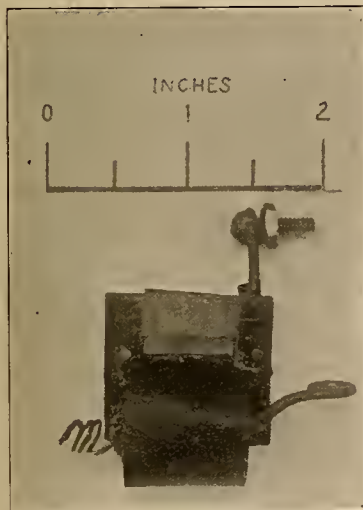
California coal was burned successfully in pulverized form some twenty years ago in a small plant in San Francisco. Its use on a large scale is simply a question of relative prices of coal and oil. The California Coal fields, while not extensive, are an asset that will prove of great value as the scarcity of fuel oil increases.

Increasing Revenue by the Watthour Meter

BY OTTO A. KNOPP

(Although the induction watthour meter is both accurate and reliable, it often lags far behind the desired standard under the heavy overloads to which it is submitted. A curve straightener which permits the accurate recording of heavy loads by a small meter offers a solution of the difficulty. The author is with the Distribution Department of the Pacific Gas & Electric Company. The paper forms part of the convention report of the Engineering Committee, Pacific Coast Section, N. E. L. A.—The Editor.)

The modern Induction Watthour Meter is a remarkable engineering development. From the standpoint of range, accuracy and reliability, it is unsur-



The Curve Straightener

A very small series transformer which diverts about one-fifth of the current from the current winding of the meter.—It weighs only 2 oz. and can be mounted inside the standard 5 ampere meter.—Fig. 1.

passed by any other electrical instrument, and yet the severe requirements of the service for which it is built overtax its capabilities. It can be termed the "cash register" of the electrical companies' revenue; therefore, its accuracy and the sustenance of its accuracy under all conditions of service is of paramount importance. The present day electric service requires that a meter measure accurately a very small and very large energy flow. This is particularly true in all small services, and also in many large services.

The Advent of Appliances Changes Problem

Labor conditions have made the cost of frequent tests and inspections of the multitude of small capacity meters prohibitive. It has, therefore, become more imperative than in the past to select the meter as small as possible for the service to obtain the highest possible torque and thus insure accuracy on light loads. The five ampere meter had for that reason been the standard in most electric service companies until, in recent years, a new factor entered into the consideration for the selection of the proper size of the meter. This factor is the very extensive use of all kinds of electric appliances such as five and ten ampere electric heaters, flatirons, percolators, toasters, etc., placed into service without the knowledge of the electric service companies. Such appliances, together with lights, cause the five ampere meter to operate on 10, 12 and even 15 amperes. The meter manufacturer has partly taken care of this condition by giving the five ampere meter an extra large overload capacity. A modern five ampere meter will carry continuously over twenty amperes, but will do so only at a greatly reduced speed. Carrying twenty amperes, the under registration is in the neighborhood of 15% to 20%; at 15 amperes around 6% to 8%; at 10 amperes 2% to 3%. This under

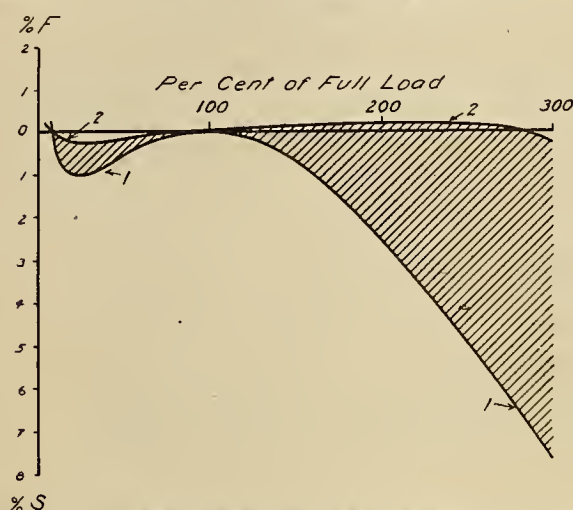


AGUE patriotism pays no bills

—Victory Loan

registration and consequent loss in revenue has caused a number of western power companies to go to the expense of using the 10 ampere meter as their standard, reasoning that by increasing the accuracy on loads of 10 amperes and over, they are gaining more than the interest on the extra investment* in a larger meter plus the additional losses caused by under registration of the 10 ampere meter due to its torque being one-half that of the 5 ampere meter on the same loads.

For several years it has remained a matter of argument, which loss in revenue to the power companies is greater, the short hour overload loss, due to the drop in the accuracy curve of the 5 ampere meter, or the loss due to under registration of the



STRAIGHTENING THE CURVE

Curve No. 1 is an average typical load curve of 3 different makes of induction watt-hour meters—Curve No. 2, an average load curve of the induction watt-hour meter with the curve straightener applied. The shaded portion represents the percentage load registration gained.—Fig. 2.

10 ampere meter on the long hour light loads from night lamps, hall lamps, porch lamps, etc., but in all cases it has been conceded that the loss is appreciable; so appreciable that some companies were willing to invest 25% more in the same number of meters to regain only the difference between the two losses. It is very obvious that the greatest gain could be secured if both losses could be avoided. This can be accomplished by retaining the 5 ampere meter with its higher torque as the standard and improving its performance so as to get accurate registration up to possible 15 amperes.

A Curve Straightener

Investigations conducted in the laboratory of the Pacific Gas & Electric Company by the writer have led to the development of a so-called "Curve Straightener," a separate little device weighing only 2 ounces, which can be mounted inside the standard 5 ampere meter, and a modification of this device which can be connected externally to the meter, giving such meters a practically straight curve. This is accomplished by the application to the meter of a very small series transformer, shown in Fig. 1, which diverts about 1/5 of the current in the circuit from the current winding of the meter. The exact amount of current diverted depends on the amount of cur-

rent in the circuit, and it has been found that the series transformer can be so designed that its characteristic compensates for the diversion of the meter characteristics from a straight line, beginning at the smallest loads and extending to loads of nearly 300% of normal. In Fig. 2 are shown 2 curves. Curve No. 1 is an average typical load curve of three different makes of the Induction Watthour meters; Curve No. 2 is an average typical load curve of the Induction Watthour meter with the curve straightener applied. The shaded area represents the percentage load registration gained by using the curve straightener.

It is interesting to note that the gain is not confined only to the heavy loads, but that on the medium and small loads a gain is recorded, which gain is appreciable, due to the fact that such loads are usually carried over longer periods of time.

Tests Prove Satisfactory

Service tests have been conducted with a number of "straight line meters" by placing each one in series with the regular meter on a consumer's premises. Residences and stores were selected without knowledge of the character of the load and each pair of meters was adjusted so that, operated in series, both meters recorded exactly alike at 10% and 100% of full load, as shown in the accompanying diagram. With the exception of one installation where the gain was only .65% with the smallest bill of about \$1.50 per month, the gain was over one per cent in others. The maximum gain was 1.5%. This maximum gain was recorded in a small tailoring shop, where a few lights were used practically all day and an electric sad iron several times a day; the bill amounting to about \$8.00 per month.

Only five of such straight line meter installations have been investigated up to date, and there is good reason to believe that larger differences will be found in many cases. The extra cost of a straight line meter over the regular meter is only about 12c, according to estimates by leading meter manufacturers, if the former meter is manufactured in place of the latter. The interest on this extra investment amounts to only 5c per year per meter. If each 5 ampere meter brings in the average, say \$20.00 per year, and one per cent is gained, the net gain would be 19.5c, or a return of about 160% on the extra investment.

Looking at it from another standpoint,—if we assume the net balance of an electric company is 20% of the gross revenue, an increase in the gross revenue by 1% would mean a 5% increase in the net balance.

Another advantage gained by using a straight line meter is found in the elimination of all disputes over what is the accuracy of the regular induction watt-hour meter operating under a widely varying load. Many of the eastern power companies have gone to great expense in the testing and computing to arrive at a fair average value; all on account of the diversion of the meter accuracy curve from the straight line.

*A 10 ampere meter costs, net, about \$1.50 more than the 5 ampere meter.

The Electric Welding Load

BY JOHN HOOD

(A knowledge of the requirements of electric welding aids materially in intelligently handling this load. The various classes of welding and their special features are here briefly surveyed by the author who is industrial engineer with the San Francisco office of the General Electric Company. This paper forms a portion of the Pacific Coast Section N. E. L. A. Engineering Committee's Report for the coming convention.—The Editor.)

Few engineering and scientific developments have made, in so short a time, strides comparable with those made in electric welding. Under the stress of war—a war so vitally dependent on engineering materials—an impetus such as would have been difficult to obtain through any other medium was given to every means of increasing production of the equipment so necessary at that time. Among the foremost materials in point of necessity were steel and iron in practically all of their forms, and every agency which possessed known or even likely possibilities of increasing the output of

shipbuilding industry, that industry being one which has been under constant pressure to increase output during the war and which at the same time, involved the use of enormous tonnage of steel together with the necessity for water tightness and oil tightness of much of the structure of each vessel.

However, other industries have not been blind to the advantages derived and electric welding has found a welcome place in automobile factories, railroad shops, boiler ships, foundries, sheet metal working establishments, machine shops and in various businesses producing metal products varying from the size of a pin head to pieces weighing several tons.

Two Types of Electric Welding

Practically all electric welding may be classed under two general headings, resistance welding and arc welding. The former is closely allied with the old process of "smith welding" or "impact welding" which consists primarily in



15 inches diameter, nickel-steel shaft reclaimed through building by arc welding after being mis-machined. Value of the shaft, \$800. Cost of reclamation work, \$50.

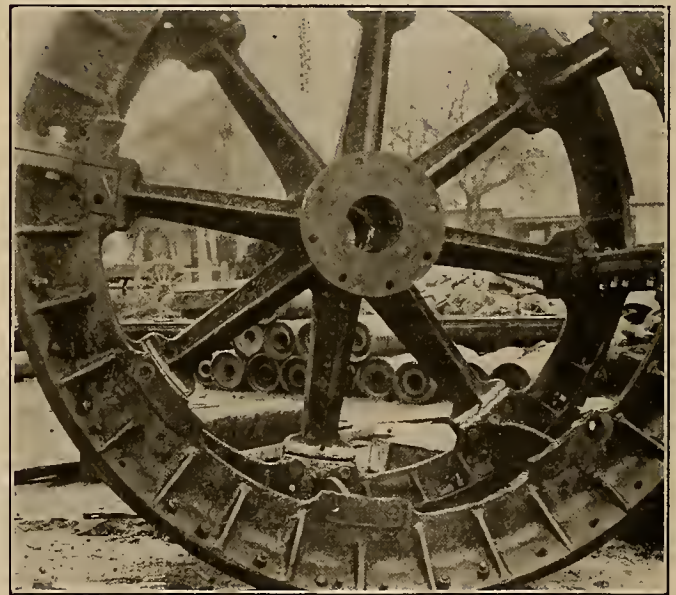
metal products, and ferrous metal products in particular, was brought into service and its possibilities developed through intensive research and test.

War Need for Electric Welding

Naturally electric welding in its various forms came to the front by leaps and bounds, permitting as it does, in a very extensive section of the industries using ferrous metals, of carrying out more economically, expeditiously, and in general more perfectly than by other methods the effective joining of heavy steel parts; the reclaiming of broken, defective, or wrongly machined castings and forgings practically regardless of form or size; the repairing of fractures and building up of worn parts in heavy pieces of equipment without the necessity for disassembling and removing such parts to the shop; the elimination of time and expense involved in laying out, drilling, reaming, riveting and calking of both heavy and light plates for practically all types of structures; the making of water tight and oil tight seams at a lower cost, with greater rapidity, and with greater assurance of success than by other methods; the joining of ferrous to many non-ferrous as well as a considerable number of non-ferrous to non-ferrous metals and alloys. Many amplifications of the foregoing processes, too numerous to mention in a paper of this kind, are in practical and constant use today but the possible fields of application have, in reality, been merely scratched.

The Field of Application

Very naturally the greater part of the development of the use of electric welding has been in connection with the



Arc welding arms to rim of 24,000 lb. wheel.—Entire structure cast steel. Gas welding previously tried did not prove satisfactory for this job.

heating the two pieces of wrought iron or steel to be welded to a temperature at which the metals are plastic, bringing the surfaces together and applying pressure through hammering or its equivalent, resulting in a union of the two parts. A flux such as borax is used to assist in fusing any oxide in the joint, the hammering causing the oxide to be extruded after fusion.

Resistance welding has all of the advantages of smith welding and, in addition, possesses certain points of superiority over the older process in that the heat, in concentrated form, is applied at the exact location where the weld is to be made and any oxide in the joint is melted during the fusion of the metals and is thus easily extruded by the application of pressure without the necessity of using a flux.



ACATION after this one

—Victory Loan

Various forms of resistance welding are in common use and are ordinarily designated as butt, spot, button, ridge, line, seam, point, tie or bridge welding, deriving the various designations either from the shape of the parts at the weld, as in the case of point welding or button welding, or from the process of applying the weld as in the case of butt welding, spot welding and line welding.

Due to the fact that the metal in the joint at the time of fusion is not exposed to the air, and therefore to oxidation, nor is it heated to so high a temperature as in arc welding, many metals, among them aluminum, antimony, bismuth, cobalt, copper, manganese and nickel, as well as most bronzes and brasses, can be welded together and in many cases to each other.

Alternating current is always used for resistance welding, being readily obtainable in the form of high currents at low voltages, special transformers in practically all cases forming part of the welding equipment. This class of welding requires single phase currents of from 50 amperes to 70,000 amperes at from 4 to 20 volts or from 2 kva. to 1400 kva., the area of the weld and thickness of material handled determining the current necessary. The power factor of this type of welder is usually between 30% and 40% on 50 and 60 cycle circuits and between 60% to 75% on 25 cycle circuits.

Load Factor in Resistance Welding

The load factor* of resistance welding varies greatly with the work in hand, depending largely on the accessibility of the parts to be welded and on the portability of the welder where it must be moved, as the welder is inherently a cumbersome affair. The load factor ordinarily ranges from 80% for the smallest line welders to 25% for the largest spot or butt welding units.

This type of welder turns work out rapidly, is suitable for use by relatively unskilled labor and will, therefore, be used principally where labor is high and rapid duplicate work at low cost is required. It is not in general adapted to short jobs involving relatively few operations, nor for work away from sources of considerable power, as it is heavy, bulky and requires relatively large amounts of power.

Arc Welding

Arc welding falls into two general groups, one using a carbon electrode and the other a metal electrode and both being susceptible, with certain practical limitations, of use on either direct current or alternating current circuits. Both depend upon the same general basis for successful welds, namely the heating to a welding temperature, by means of an electric arc, of the metal to be welded and the metal to be added, in such a manner as to form a fusion bond between the parent and added metals. This new or added metal may be used as a bond uniting the two pieces of parent metal or merely in building up or adding to a single piece of parent metal.

Carbon arc welding is, in practically all cases, done by direct current. The fact that heat in any arc is largely concentrated at the positive electrode is taken advantage of by connecting the positive side of the circuit to the piece to be welded and the negative to the carbon electrode. The heat necessary to fuse the metal is, therefore, concentrated to a large extent at the point where most needed. In addition to this, no carbon is introduced from the electrode into the weld as would be done if the current were reversed in polarity. In using a carbon arc on an alternating current circuit, the carbon as a whole becomes very hot, therefore being uncomfortable to the operator, and the work loses the benefit of the concentration of heat at the weld obtained when connected on a direct current circuit as above mentioned.

Four principal classes of work are usually handled by this process:

1st: The most important and incidentally the simplest, being the cutting or burning off of iron or steel parts such as heavy gates on castings and for reducing scrap metal to sizes suitable for convenient handling. This is in reality not welding but burning of metal and is used where the resulting irregular or ragged surfaces, which are unavoidable in this process, are not objectionable. Wherever a relatively smooth, clean-cut surface is desired, the oxy-acetylene flame is superior to arc cutting.

2nd: The welding of heavy pieces of iron or steel by using very heavy currents.

3rd: The filling the holes and cracks in steel, iron, brass and bronze castings.

4th: The welding of brass and bronze.

In all but the first class, rods of material of the same general type as the parent metal are fused into the section to be welded.

The current required for the carbon arc is usually from 100 to 1000 amperes with approximately 50 volts at the arc. However, the most equipments of this type depend upon a series resistance to limit the short circuit current at the time of striking the arc, the power required may be of any value between two and twelve times that absorbed in the arc, depending upon the supply voltage. On electric railroad track work where the power is taken from 500 or 600 volt circuits, the energy at the arc is sometimes as low as 8% or 10% of the total power consumed in the outfit. In general, however, the power used, in other than extreme cases such as the one just mentioned, would be from 2 to 4 times the arc power. The load factor on carbon arc work ranges from 40 to 75% on welding or practically uninterrupted cutting work.

Metal Electrode Welding

Metal electrode welding is very similar to carbon arc work but in place of feeding a rod of new metal into an arc formed by other agencies, the metal to be used into the joint is used as an electrode, melting off in small particles and fusing into the parent metal, the same scheme of connections being used and polarities observed as in the case of the carbon process. The objections to alternating current operation are, however, not so valid as with the carbon arc, as satisfactory work can be done with an alternating current arc when skillfully handled and when overhead work is not necessary.

Metal electrode welding covers by far the larger part of the arc welding done at the present time and is thoroughly successful. Considerable difference in opinion still exists regarding the efficacy of direct current vs. alternating current; the relative merits of coated, uncoated, dipped or covered electrodes; and the best chemical composition of electrodes for this class of work, but in spite of all differences of opinion, satisfactory welds are being made with almost any combination of these variables within reason. Good welds have even been made when using uncoated fence wire as an electrode. I do not mean to imply that these variables are unimportant and that careful investigation to determine which can be used to best advantage is not justified, but merely wish to point out that at worst, the work can be successfully done with relatively unsuitable materials when the work is handled by a skillful operator. Obviously, the use of processes and materials which are more nearly perfectly adapted to the work is to be encouraged to the utmost.

The metal electrode process is applicable to all steel and wrought iron welding, can be used on brasses, bronzes and malleable iron to quite an extent, and to a very limited extent on special cast iron jobs. The current required is usually between 20 and 200 amperes, depending upon the thickness of the parts to be welded and upon the diameter of electrode used, most of the work being done between 80 and 150 amperes with from 15 to 25 volts at the arc and using 3/32 to 3/16 inch diameter electrodes. Higher arc voltages are apt to cause excessive oxidation of the welding metal and the

*The load factor used throughout this paper is the hourly load factor. Load factors for longer periods depend to such an extent on the class of work being handled as to be too variable to be of significance in a general statement.

inclusion of iron oxide in the weld is detrimental to its strength and soundness. When a series resistance is used to limit the short circuit current at the time of striking the arc, about 2 to 4 times the power above indicated must be supplied due to the waste of energy in the grids.

Load Factor of Metal Electrode Welding

Several machines in the shape of motor generator sets having characteristics which automatically take care of the voltage under varying current conditions, so as to maintain approximately constant current in the arc, are now on the market and increase the efficiency approximately 25% over the grid type of equipment. The load factor of metal electrode welding on fairly accessible work and at small and medium current values is approximately 65% to 75%. On very heavy currents the load factor falls off a few per cent due to the necessity for inserting new electrodes more frequently than with smaller currents. Ordinarily a 3/16 in. diameter electrode 12 in. long, will last approximately 2 minutes when handling a current of 150 amperes. An increase to 200 amps. reduces the life of the electrode to about 70 seconds.

Bettering the Load Factor

The above consumptions at the arc apply to either direct current or alternating current equipment but the kva. input when operating on alternate current is materially above the kilowatt input as may be appreciated from the fact that transformers for alternating current arc welding have an inherent reactance of approximately 90%. The power factor of such an equipment is usually between 15 and 25% lagging, which, unless corrected by a near-by condenser, imposes a rather unattractive load on distribution lines and generating equipment. In regard to the effect of low power factor in limiting output of generating equipment the following instance is cited. It is well known that one of the chief limitations in securing output of alternators is in the construction and design of the revolving field. The excitation of the average standard alternating current generator at 80% power factor and full kva. output is approximately

double the no load excitation and about 250% for 20% power factor. In addition to thus limiting the output of generating equipment, line regulation would be seriously impaired and fixed charges on equipment and standby losses would become a serious burden. This, however, can be taken care of by installing either condensers of proper capacity at the welders or motor generator sets each having a motor suitable for the commercial circuit supplying the power and driving a single phase generator of proper voltage and characteristics for handling the arc. In most cases the former will prove the more economical and in general the more satisfactory of the two methods.

Enlarging the Field

Proved economies and facility of operation will continue to enlarge the scope of electric welding in its various forms. Electric welding has reached a point where no fundamental reason remains for doubting its effectiveness and usefulness. On all but the lightest work, and on cast iron, it is superior to any other process of welding from the standpoint of cost of work and is comparable in every way with the best product of other processes. A typical case is shown by a comparison in which a carefully kept series of costs in a railroad shop where a given group of jobs had cost \$7839 when welded by processes other than electric was done, and identical jobs were electrically welded at a cost of \$1154, a saving of approximately 85%. The reclamation of material which would go to the scrap pile if welding were not resorted to, shows economies which are even more striking when the possible scrap value plus the cost of welding is considered in relation to the purchase price of new parts. A saving of several hundred per cent on such items is not unusual on heavy work.

The significance of such performances is becoming appreciated to a greater and greater extent and can not but build up the welding load. A knowledge of the requirements of the various classes of this work, coupled with a realization of the possibilities of usefulness of each class, will aid materially in having electric welding intelligently applied and the equipment properly served.

Kilowatt Hours per Barrel of Oil. What Does It Mean?

BY S. J. LISBERGER

(The value of comparative statements is based upon an assumed parity of the terms used. Some of the inaccuracies involved in the use of the term "kw-hr. per bbl. of fuel oil" are here pointed out and an alternative basis of comparison suggested. The author is chief engineer for the San Francisco district with the Pacific Gas & Electric Company and the paper is one of the group presented by the Engineering Committee of the Pacific Coast Section N. E. L. A.—The Editor.)

During the past twelve months the unfavorable weather conditions, due to the small rainfall, have caused a serious shortage on the several hydro-electric systems on the Pacific Coast, as a result of which the operating companies have been forced to generate a very large amount of electric energy from steam plants, which plants burn oil for fuel. The increased use of fuel oil has, of course, increased the cost of production of electric energy.

Managers and operating engineers on the several systems where this condition has prevailed, have been comparing notes, as it were, on the so-called efficiency, or what might better be termed the result of operation of their respective steam plants. It has been the custom to talk of this result or efficiency of oil burning, in terms of "kw-hr. per barrel of oil." This term "kw-hr. per barrel of oil" is very likely to be misleading; to mean one thing in one plant and something different in another

plant. It will be the purpose of this paper to discuss in short form some of the errors that are introduced when making comparisons on the basis of "kw-hr. per barrel of oil," and from this discussion it will be readily seen that the cost per kw-hr. for electric energy generated by steam will vary very widely, even in the same plant.

The thoughts expressed herein are probably quite familiar to many operating men, but I feel that they have not been taken into consideration when discussing the results of steam plant operation. It is the further purpose of this paper to endeavor to clarify the situation for future discussions.



VERIFY your citizenship

—Victory Loan

The conditions of operation mentioned herein are such as are, or may be, met in the operation of steam plants in connection with the hydro-electric systems on the Pacific Coast. This should be borne in mind, as it has a very definite result in the plant operation.

Energy Generated or Delivered

The first question that arises is: "What is actually included in kw-hr.? Does it include all of the kw-hr. generated in the plant, or does it include only a part, or does it mean something else? For example: Assume a station having three turbines generating energy at 11,000 volts; in this station there are approximately 500 kw. of steam driven exciters. The auxiliaries in the station are partly steam driven and partly electric driven, some of the electric drive being by a.c. motors and others being by d.c. motors, such d.c. equipment being fed from the exciter system. If the energy generated is metered at the terminals of the turbines just before it reaches the main station bus-bar, and if all the a.c. supply to the station is in turn metered at the bus-bar so that proper deduction for use in the plant will be recorded, you will get a certain record or result; but if, on the other hand, you add to the kw-hr. generated by the turbines that energy generated by the exciters, and if you do not make proper record and deduction for uses of the d.c. in the station, so as to make it comparable with the a.c. metering, another figure will result. This statement may seem to be rather out of place, but in talking with many operating men, and upon being asked: "How many kw-hr. per barrel of oil do you generate at your plant?" I am invariably given figures anywhere from 180-240, but with no qualifications as to how the result is obtained. In other words, does the term kw-hr. mean kw-hr. generated or does it mean kw-hr. delivered? There may be a very considerable difference between the two figures, depending upon plant conditions.

I say this difference may be considerable. This will depend on how the auxiliaries in the plant are driven, that is, whether steam or electric, and furthermore, how large the electric auxiliaries may be, and where the meter records are taken.

Operation of Auxiliaries Affects Economy

The operation of these electric auxiliaries may vitally affect the economy of the station. This will be brought out more in detail later on. It is furthermore of prime importance to have a common basis of understanding as to what kw-hr. means. After all, it does not make very much difference, for the purpose of comparison, whether you take the kw-hr. generated or the kw-hr. delivered, if you will only recognize a common standard, or if you will qualify your term so that it may be reduced to what might be termed a common standard.

The next question that arises is: "How does your plant operate in connection with the hydro-electric system?" It may operate in one of three ways, each of which will vitally affect the economies of the results obtained.

1. The steam plant may deliver a definite block of energy to the hydro-electric system through predetermined hours of the day, month or year, as the case may be, supplying no energy other than to the hydro-electric system. The question whether the station regulates the system voltage and speed will have a bearing on the results.
2. The plant may be operated in such a way that it supplies a certain locality and at the same time delivers a certain amount of energy to the hydro-electric system, and in the meantime acting as a regulating station for the general hydro-electric system, to which it is connected.
3. The plant may perform a combination service, namely, delivering energy to the transmission system and to the immediate territory in the vicinity in which the plant is located, during a part of the day, and during the other part of the day it may be operating as a standby plant, floating on the hydro-electric system, ready to deliver at an instant's notice a definite amount of load to the territory in which the plant is located, should the hydro-electric supply fail, there being no interruption of service to the city in which the steam plant is located. This combination service may vary radically within the 24 hour period. The question as to how the plant regulates the system voltage and speed will also have a bearing on the economy of operation.

Practice in San Francisco Station

Let me illustrate by speaking of a plant and the system in connection with which it operates, with which we are all more or less familiar. The plant is Station "A" San Francisco, on the system of the Pacific Gas and Electric Company. In the station there are three turbines, with a boiler room capacity, let us say, sufficient to supply 40,000 kw. at the present time. The San Francisco city load, let us assume, has a daily average of 28,000 to 32,000 kw. and a peak depending on the seasons of somewhere between 36,000 and 44,000 kw. A tie exists on the south with the hydro-electric system, through which there can be delivered energy to the extent of 14,000 kw. A tie exists by the Golden Gate cables on the north, through which there can be delivered 10,000 kw. Let us apply the conditions of 1, 2 and 3 above to this plant.

1. The conditions of No. 1 would hardly ever be applicable to this system, inasmuch as the steam plant is located in San Francisco and is used entirely under the conditions of No. 2 and No. 3. This condition, however, might apply to any one of the several plants of the Southern California Edison Company or the Great Western Power Company.
2. There are certain seasons of the year when Station "A" delivers to the San Francisco local system about 30,000 kw. and delivers its excess capacity to the transmission system to the extent of 4-6-8000 kw., depending upon the needs of the system.

As the pumping plant supplying salt water to the condensing system is electrically driven and as the units are quite large, the kw-hr. net, delivered, will vary considerably with the amount of load being delivered to the transmission system, as certain pumps will be necessary for an operation, say, up to 30,000 kw., but above this load other pumps will have to be put on the line to supply the circulating water, and if, say 35,000 kw. of energy must be delivered to the system over a long period of time the quantity of energy used for pumping water may be considerably larger in proportion than, say, the load on 30,000 kw., and herein comes the question whether you are speaking of kw-hr. generated or delivered, and herein also enters the question as to how the plant is operated.

Furthermore, depending upon conditions prevailing on the hydro-electric system, the plant may deliver

energy to the hydro-electric system on the south end and receive hydro-electric energy on the north end, one or more turbines being operated in parallel with the north end receiving energy, this depending upon load conditions. The turbines may be called upon to regulate for speed and voltage control.

3. During the season when water conditions are very good, the transmission system will deliver to the San Francisco system as high as 20,000 kw. As there are two routes over which this energy may be delivered, and as it is not feasible to parallel through these two routes, it necessitates the operation of two turbines on one side of the system and one turbine on the other side of the system, on the assumption that the steam station shall supply 12,000 kw. to the system, in the meantime running in parallel with the San Francisco system, and ready on an instant's notice to deliver to the city system the amount of energy that the transmission system is supplying, should the hydro-electric system fail.

This is accomplished by carrying one fire under the sufficient number of boilers that would be required to carry the total load, so that when the transmission fails the other burners under the same boilers (three burners per boiler) have merely to be turned on and by proper regulation in the boiler room, the load can be handled, and is handled, without interruption.

These above three conditions are given in order to explain the conditions of operation that may pertain. With these various conditions it will not be difficult to understand why kw-hr. per barrel of oil should vary very widely, and have no real meaning when used for comparative results, even on the same system.

Electric companies have for a long time realized that the consumer who had a good load factor was a very much more profitable consumer than one who used power only over the peak or only at rare intervals. This is evidence by the fact that low rates per kw-hr. are given to consumers with a good load factor, while considerably higher rates apply to those consumers to whom standby service must be supplied. I think the justice of this type of rate is quite evident to all public utility men and to the consumer.

Before we endeavor to compare the results of our several systems we should compare the load factors under which the plants are operated. It is almost unnecessary to state that great variations in the daily load factor do not tend toward economic results, particularly where the variations are very marked in a short period of time, and furthermore the heat balance of the plant is always difficult to maintain under the best conditions of operation. Furthermore, it is difficult to obtain the best results from the operating force, where conditions are changing radically during short periods of time, even granted that there be sufficient diversity in the types of auxiliaries to make allowance for the heat balance.

I think from the foregoing you will recognize that the term "kw-hr. per barrel of oil" has very little meaning unless the conditions under which the plant operates are very definitely specified, and therefore few comparisons may be made between different plants, or as stated before, it is very difficult to make comparisons even in the same plant, where conditions of operation change radically from year to year.

It is therefore very difficult to conceive what "kw-hr. per barrel of oil" should be under these varying conditions, because the changes can be so radical and so different.

In order to visualize just what is taking place in the plant we have made use of certain curves. (Owing to delay in their receipt, these could not be shown here, but will be found elsewhere in this issue on page 399.) From these curves we can get a much better idea of how the plant is being operated than by using the terms "kw-hr. per barrel of oil."

From these curves it can be seen how the results vary through the month.

These curves are extremely interesting, since if a continual record is plotted you can determine by month or by year the amount of oil required for a standby. If a record of this kind will be kept for a sufficient period of time, and if you may assume the conditions under which the plant will operate, you can pre-determine the amount of oil which will be necessary for any assumed period of operation. Furthermore, the curve makes a very simple record for yearly comparisons.

In conclusion, I desire to emphasize the purpose for which this paper was written, namely, to show that the term "kw-hr. per barrel of oil" means nothing unless the conditions under which the plant operates are most properly qualified, and (2) to point out to the operating man and the managers that the cost of energy where fuel oil is burned varies very largely with the operating conditions of the plant and with the load factor under which the plant is operated. Furthermore, it is very difficult to make comparisons, particularly under our Western conditions. It is far easier for the coal burning plants, operating under conditions more fixed than ours, to make comparisons of their energy costs for coal or oil burning plants.

The steam plant of the Western coast has a very definite function to perform and in performing this function it is often necessary to render service rather than efficiency, particularly when expressed in terms of "kw-hr. per barrel of oil."

UNDERGROUND DAYLIGHT

A recent item in the London Electrical Review describes a very interesting example of illumination employing a concealed source of light, in the daylight window-lighting effect at the Cafe Cairo, Dublin. The room is entirely underground with entire absence of daylight. For the lighting 100-watt half-watt type Mazda lamps are used, equipped with X-ray reflectors placed outside the windows.

The light is thrown upon white millboard, from which it is reflected through the arctic glass of the dummy windows, producing the effect of morning sunshine which is very pleasant. Hanging lanterns are used at midnight in the event of dances, when the daylight effect is not desired.



VALIDATE those promises

—Victory Loan

The Proper Training of the Sales Personnel

BY LEE H. NEWBERT

(The elements to be considered in the selection and training of the sales force of any business with special reference to the conditions and present practice of the electric utility company. The paper, which forms part of the Commercial Section Report to the Pacific Coast Section N. E. L. A., was prepared by the manager of the Commercial Department of the Pacific Gas & Electric Company in collaboration with J. F. Pollard of the Sierra & San Francisco Power Company and I. W. Alexander of the San Joaquin Light & Power Corporation.—The Editor.)

In every organization manufacturing a saleable product the Sales Department is of the greatest importance, for no manufactory can exist unless a demand is created for its products. The degree of success attained is directly traceable to the department which disposes of this product or commodity.

Contemporary business history furnishes many examples to prove this assertion. For instance, the National Cash Register Company's tremendous success is due to a sales force carefully selected for natural fitness and ability and then educated and developed to the highest degree of efficiency.

The Public Utility's Sales Department

It may be said "True, but this cannot apply to the electric utility because that is selling mainly a service and not a product, and it is a service with which the public can not dispense. Why, therefore, should salesmen be necessary to a utility?" It has been amply proven that no theory could be farther from the truth. It might almost be said that the utility of today is as much a purchaser as a seller,—as much a buyer of good will to be paid for in services as it is a seller of kilowatt hours. No utility that is not on harmonious terms with the population it serves can be considered successful when judged either by the standard of proper functioning as a public servant or from a financial standpoint.

The principle of commission regulation of utilities has become an established institution. As constituted in this state, the regulatory body has absolute control over the rates on which the utility depends for its life-blood and for its financial success. When this present regime was first established, more or less doubt was expressed as to what the result would be. The more skeptical advanced the theory that the utilities would suffer. It has developed, however, that the members and staff of a progressive Railroad Commission and the forward-looking men of the public generally are realizing more and more that the interests of the public and those of the utilities serving it are one and the same. The services of the Utility Salesman in fostering and developing this idea are thus indispensable and quite as much of his time must be devoted to this duty as to the actual selling of electrical energy and appliances.

We therefore reiterate, that in the electric utility organization more than in that of any other manufacturing business, the salesman as the point of contact is not only important,—he is absolutely essential. It is, therefore, particularly appropriate that we should at this time direct our thought and attention to the question of "The Proper Training of the Sales Personnel."

The Type to Select

Before we can proceed, however, to the consideration of the salesman's training, it is necessary to give careful thought to the type of person which we would select for induction into this important branch of our organization.

Whenever possible the prospective salesman should be selected from the ranks of the company because of his good record for faithful service and loyalty,—two very essential characteristics. Unquestionable integrity and honesty are, however, the first requirements, because the company's reputation with the public will depend very largely on that of its salesmen who quite frequently, in the eyes of the public, are the company, and it has been well said that an employee who will steal for you will also steal from you. Our candidate should also be neat in his personal dress and appearance and, to use a time-worn phrase, "Be able to meet people." By this we do not necessarily mean that he must spend a lot of the company's money, or his own, for drinks for the prospective customer, or lose it to him in a game of poker, but that he should have an easy manner of address, be unfailingly polite on all occasions, have complete control of his temper and make friends easily. In short, he must be a gentleman in the true sense of the word.

The electrical industry is inherently technical and it will be a great advantage if our prospect has at least some education in technical matters. This, however, is not absolutely essential and can be dispensed with if he has a good general education and more than average intelligence.

Women as Salesmen

Women as sales-people can be used to excellent advantage. As canvassers and demonstrators in the sale of household appliances it is obvious that a woman can command more respect and attention in talking of the advantages in lightening housework and cooking by the use of such appliances, and the proper methods of handling them to get the best results. She will be listened to more attentively and what she has to say will be accepted with better grace than would be the case should a man attempt to tell the housewife the same facts.

The sales-room also offers a field for the profitable employment of women. The woman who shows that she understands electricity and its application is somewhat of a novelty. She, therefore, will command the admiration of the feminine trade. Her knowledge and well-prepared selling talk will be more or less awe-inspiring and will have a great influence in closing the sale. The appearance of a

bright, cheerful, neatly dressed young lady in a fixture or appliance store will increase its attractiveness and make it more inviting to the prospective woman purchaser, nor will her presence fail to impress the masculine trade favorably.

Having selected the most likely candidates with due regard to their native qualifications, let us next turn our attention to those qualities which it will be necessary to develop by our proposed course of training so as to best fit our sales-people for the work of selling our particular product.

Satisfactory Service

The meat of the nut of salesmanship is satisfactory service. In the ordinary routine of our lives, when it becomes necessary to buy a pair of shoes, if the clerk is obliging and courteous and makes certain that you leave the store in a pair of shoes that fully meet your requirements, the next time it becomes necessary for you to purchase shoes you will make an endeavor to buy from this same clerk. The matter of the proper fit of a pair of shoes is of much importance to every one of us; so with the farmer and the selection of his pumping plant, or the housewife with the choice of her electric stove or washing machine. The article in all cases must fit the requirements. If anything goes wrong with these articles of vital necessity, the effectiveness of the day's operation on the farm or in the home is greatly decreased, resulting in complaint and dissatisfaction. If your new shoes pinch you or a poorly made heel drops off, what is the first thought that comes to your mind? Why, the salesman who sold them to you, of course, and the desire to return the unsatisfactory shoe to him for proper repair. Therefore, it is reasonable to believe that the housewife or the farmer will have the same thoughts as you do under similar conditions. If the purchaser does get in touch with the salesman and he in turn sends the customer away again satisfied, he will have accomplished only that which is expected of him in his relations with the public.

Familiar With Company's Policies

It is essential that our salesman should be thoroughly schooled in the policies of the company and in the workings of its every department. He must be familiar with conditions and policies in the financial and executive department so that he may be able to direct his efforts to the additional load where the necessary extensions of service will be of such a kind as can be met from available finances. He must be thoroughly familiar with the policies of the credit department so that he can advise a customer what must be done to establish credit and be able to explain why. All utilities in this state are operating under general rules established by the Railroad Commission governing this question, and the public is already quite generally informed. A careful and strict adherence to these rules, together with such information as the salesman can obtain in regard to a prospective customer's credit, will be of material aid to the credit department in obviating the necessity for suing delinquents, because it will minimize the number of delinquents.

A knowledge of the procedure in the engineering and construction department will make it possible for the salesman to see to it that the extensions which are most urgent will be taken care of in advance of those which may have been signed up at an earlier date, but which are not so pressing. It will, also, enable him to advise the customer as to what kind of an installation and equipment will pass the inspection department.

Familiarity with the routine of the despatcher's office will enable him to prepare the power consumers for interruptions and do whatever may be possible to minimize the inconvenience occasioned thereby.

Co-operation between the sales force and every other branch of the organization must be as perfect as obtainable, for the salesman must never make a promise unless he knows that the other departments can and will make good, or vice versa, the other departments must never fail in a promise once made by the sales force. In this way only will confidence be established and maintained.

Knowledge of Wares Essential

In addition to the closest possible contact and co-operation with their own organization our salesman must be thoroughly familiar with every detail connected with the appliance or service which he is delegated to sell.

If he is selling appliances he should know of what they are made, how they are made, whether or not they can be repaired, and if so, what the cost will be, how they compare with others of a similar kind in prices and efficiency and should be able to give a good reason for price difference. He should never "knock" a competitor or his goods. If his competitor's product has points of superiority he should gracefully admit it, at the same time truthfully maintaining and explaining the meritorious points of his own product. Truth and frankness pay in the long run. In time the customer will surely find out if he has been deceived, and if so, confidence in both the salesman and his company will be destroyed.

If a salesman is selling service for agricultural pumping plants he should be familiar with, and be able to discuss various types of pumps, water lifts and many other matters in which the farmer is vitally interested as well as the cost of kilowatt hours and the line extensions.

The tendency of present-day rate-fixing practice is to make a "scientific" rate, full of reference to "power factor," "load factor," "demand factor," "energy charges," "service charges," "customer charges," "demand charges," "minimums," "discounts" and "penalties," most of which are worse than Homeric Greek to the average customer. It, therefore, devolves upon the salesman to thoroughly understand the principles of rate-making and to be



IRTUE meets its obligations

—Victory Loan

able to pick out the most economical rate for his customer's conditions and to work out the same to his complete satisfaction and understanding, if possible.

The Question of Training

Having decided on the personnel of our sales force and the broad lines along which they are to be trained, we now come to the main subject in hand, viz., how to train them, and glancing back over the prescribed essentials we must admit we have set out upon a man-sized job. However, it has been done with more or less success and we must therefore not despair at the outset.

First we must offer him a salary commensurate with his position, which you will remember is in the most important department of the organization. We do not ask him to work for a salary that the meter setter would not consider, for we remember that this man is going to make work for the meter setter. We also bear in mind that it will cost something to educate this salesman to a point where he is of real worth to the Company and we realize that the compensation must be such as to attract a competent and aggressive man and keep him loyal.

Among several of the larger Eastern utilities that serve vast populations, the salesman and other representatives who come in contact with the public, have first to pass through a school of instruction in which they are thoroughly equipped with the necessary knowledge and information for their particular lines of work before beginning to sell.

When a prospective salesman has been selected he is schooled in the policies of the company, shown the methods of operation of the different departments and finally drilled in all the matters necessary for a complete understanding of the service or commodity he is expected to sell. When he has successfully passed through this school of instruction he is given the position of a salesman, and not before. His work is carefully watched and if he shows any aptitude for selling, he is persistently encouraged and his record carefully watched. Should he be sent out to sell a line which is new to him, he must again school himself for this work. This, of course, is the ideal way of making salesmen; but to the most of us who are at this time so vitally interested in the proper development of our sales forces, this plan is beyond our reach and we have of necessity to consider more immediate result-producing possibilities.

N. E. L. A. Courses

Here the National Electric Light Association has come to our aid with a series of most admirable correspondence courses. It offers "Practical Electricity" which is intended to give a knowledge of the necessary fundamental principles (tuition, twelve dollars); "Commercial Engineering," which covers thoroughly and completely the selling end of the industry in all its branches (tuition, fifteen dollars); "Elementary Accounting," covering fully the fundamental principles of bookkeeping and accounting (tuition, sixteen dollars); "Advanced Course in Electric Utility Accounting," including all phases and the

best modern practices of our most progressive companies (tuition, sixty-five dollars).

These courses are carefully prepared by specialists and edited by committees composed of men of long experience in the electric utility business. The tuition fees mentioned include all necessary books and special material.

The Commonwealth Edison Company of Chicago has offered to advance the full tuition fee to all employees who desire to take any of these courses, the same to be paid back in small weekly payments and the Company further agrees to refund one-half of the tuition fee to those who satisfactorily complete any of the courses while in its employ. Here is an excellent opportunity and an example, especially to those smaller companies who can not afford an elaborate individual training school of their own.

Care in Selection of Employees

No two companies find their needs and possibilities exactly the same. Whatever training method we adopt, we can say without reservation that no matter what the size and extent of our organization, it must have a good, healthy morale if it is to function properly. In other words, we must have a "happy family." One organization represented here today has an employees' welfare department, through which all applications for employment pass. Not only is care taken to place an applicant in a position for which he appears to be qualified, but the progress of his work in this position is watched, and if he is "falling down" an endeavor is made to discover the cause of his failure, whether through inefficiency, indifference or domestic trouble, and an effort is made to adjust it. When an applicant is given a position, he is personally introduced to every person in the department, and all with whom he is to come in contact in the performance of his duties. He is accorded a hearty welcome and thus impressed with his importance such as he would not acquire were he permitted to shift for himself in becoming amalgamated with the organization. The good effect on the morale of organization through this simple practice can be readily imagined.

A Folder of Essential Information

Another utility concern with a representative on this committee pursues a very useful and effective means of impressing upon the newly employed salesman several delicate truths, that might cause embarrassment were the effect made to get the idea across during conversation. He is given a little folder containing four or five typewritten sheets of instructions and a statement of the policy of the company which affords the opportunity to say in an impersonal way something to the new employee about what is expected of him in the matter of his dress and personal appearance, and also of the spirit he is expected to display in the performance of his work. This idea might well be followed by us all. We should have our code of selling ethics, or a ten commandments of selling, which should be continually before our selling forces. Salesmen should be compelled to conduct themselves during working

hours according to this code and if they have the interest of their work at heart, they will. Otherwise they should not be in the organization.

To our knowledge, a certain large construction company maintains a book of rules so complete that there is scarcely a conceivable contingency that is not covered.

Such a book in our business would of course have its limitations, but it is possible to prepare at least a set of general rules for the salesman's guidance and to furnish answers to a list of the more probable questions the salesman will be asked. There is, after all, only one best way to handle each different situation, and if the salesman is schooled in several hypothetical cases his intelligence can be depended upon to select the best course of procedure along the lines of his instruction.

Such rules and suggestions can be amplified and kept up to date by the establishment of a mimeographed loose-leaf bulletin recording all changes in rules or policy. This bulletin could easily be made of great educational value by publishing an occasional sales-talk of special merit, or a talk by the general manager or heads of departments. In this manner the best thoughts of the organization may be collected for the use of present and future employees.

As an example, when the so-called emergency increases in electric rates were recently effected, this matter should have been fully covered by a bulletin that the salesman could have read and from which he could have gathered data so that he could state with conviction that loan capital, labor, fuel, taxes and material had all advanced and he could have told the consumer in just what proportion. Being so well prepared with facts and figures there could be no excuse for his making some such weak statement as "Well, I don't know why they do it I'm sure, but it's a rule of the company," etc. While a little knowledge may be "a dangerous thing" none at all is fatal.

Of course our salesmen should be instructed under no circumstances to start an argument or even waste time with a theorist, but when challenged by Mr. Average Citizen he should be sufficiently informed to protect the company and preserve his dignity. The salesman who cannot answer reasonable questions makes himself contemptible in the eyes of the customer and surely does his company an injury.

Spreading Propaganda

Our man should be taught to be a propagandist. He should be able, through the instructions he is receiving day by day to defend intelligently the policy of his company.

He should know that the utility business is being placed on a service at cost basis and that any citizen with a grievance can readily get a hearing. He should be told that public service companies are owned by hundreds of thousands of investors. He should know what the Railroad Commission does and can do. All this will result in a better knowledge of the business by the employee and if he is a good propagandist the result will be also a better understanding between the consumer and the company.

When there are enough salesmen employed to warrant its success, there is nothing to stimulate interest like get-together meetings and conventions. Here there can be an interchanging of ideas that will result in nothing but benefit.

Other Employees as Well

And not only should a training of this kind be given the sales personnel, but to every employee who in any manner comes in contact with the public. To show how easily this can be accomplished and the effectiveness of the effort, a district agent of one of our principal power companies holds weekly meetings on a regular evening at which all the members of his organization are present, including linemen and groundmen. The meetings are not lengthy but they are full of snap. After a series of talks on the organization, the methods of operation, policy and such general matters, the agent goes into the detail of his own organization, such as the necessity for good and legible penmanship, the proper filling out of reports, the duty of the employee to treat company property with the same consideration that he would personal property, the consideration of the problems of the different departments and how one department can help the other for the more efficient operation of the district to the advantage of its general record.

These weekly meetings are decidedly popular and the increased efficiency of the district is very noticeable. The agent at all times will provide ice cream or other refreshments. The result of the plan is cooperation and a general understanding that cannot be obtained by years of personal effort.

The Basis for Enthusiasm

The sales forces should be brought into closer contact with the managing heads of our utilities. The salesman should be made to feel the responsibility resting upon him and he cannot do so unless he feels that he has the confidence of his chiefs. It is necessary to inject a little enthusiasm into a sales force from time to time, and what better method is there than a talk with the "big boss." As a matter of fact it is essential that the salesman know the hobbies and the dreams of the "big boss." This would give him an understanding of present policies not clear to him, but for which, considered in connection with future operations and plans, the necessity will become apparent. Regular meetings of sales forces and branch managers offer an excellent method of arousing enthusiasm.

To quote Dr. Lee Galloway, Chairman of the National Commercial Gas Association:

"A ginger talk may carry a salesman through a day's selling campaign, but the enthusiasm that is to carry him through a whole year and keep him cheerful day after day when rebuffs are frequent and business hard to pull can come only through the proper assimilation of information and knowledge



ERY patriotic, weren't you? Well, are you?

—Victory Loan

pertaining to his job which, turning first into confidence and then into enthusiasm, builds within the tissues a storage battery of sales energy and loyalty for his firm."

Much information can be gained from the trade journals and the salesman should be encouraged to read them regularly. Also there are many valuable books on personal efficiency, scientific management, psychology and salesmanship.

Learning as Well as Teaching

Some method should be taken to ascertain the amount of knowledge our salesman is acquiring. Probably the most simple way to do this is to assign him the task of preparing an article to be read before the other men, possibly offering a prize for the best paper.

There is much to be taught our men of which no mention has been made and there are many things

of which, perhaps, we have never thought that they may be able to teach us. We have but barely touched upon the many ways in which a salesman can be of great value to his company outside of the strict limits of signing contracts.

Time and space will not permit us to enlarge upon his other activities which, however, are equally important, such as mingling in public affairs and interesting himself in charitable, business, church and the many other organizations which make up the life of the community.

He can also make himself invaluable in adjusting complaints and disputes in regard to bills or collections, or any trouble connected with the company's service, more readily than could the employee of some other department who has not established the friendly relations with the customer that to the salesman are essential to getting business as well as to retain it.

How Can the Electrical Industry Assist the Architect?

BY J. O. CASE

(A co-operation which will benefit the architect, the electrical industry and the consumer should be welcomed by all parties. Practical suggestions are here offered as to what is needed to remedy the present situation and what can be done next year. The author is associated with the local manager of the General Electric Company of Los Angeles. The paper is one of the Commercial Section's contributions to the coming convention.—The Editor.)

He who makes two sockets grow where one grew before is, according to the present-day version, just as much a benefactor as the agriculturist who increases the production of blades of grass. A great deal has been accomplished along this line by the various electrical interests, but the surface has only been scratched. Perhaps the most fertile field and the one which has been most neglected is in co-operative work between the various branches of the electrical industry and the architects. It is true some of the manufacturers have done considerable missionary work and some of the contractor-dealers' associations have also accomplished excellent results. But so far a well-defined, aggressive campaign by all branches of the industry has not been attempted. Such a campaign could well be conducted to the great benefit of all parties concerned—the consumer, the architect, central station, manufacturer, jobber and contractor-dealer.

How Will the Consumer Benefit?

Any plan such as this must necessarily fail unless its first essential is to safeguard and benefit the consumer. He is the most vital factor in any such campaign. His interest is paramount and can best be served when he gets the greatest return on his investment in electrical wiring and appliances. This is possible only when he gets a well-planned job, adequate to all of his needs, present and future, properly installed, at a fair price. The specification that does not include all of the outlets necessary, such as baseboard receptacles and outlets for appliances, does not permit the owner to get the proper return on his investment and necessitates expensive extras after the job is completed.

It is a well-known fact that an adequately wired house commands a more ready sale and is much more easily rented than one which is not so provided. If a business house is being planned the far-sighted landlord will find it greatly to his advantage to have the future wants of any possible tenant anticipated in the layout of the electrical work.

It is a rather surprising fact, and one probably not appreciated by either architect or owner, that the electrical work in a commercial structure or residence averages only about 2¼% of the total cost of construction. It is equally true that changes or additions made after completion of the job average 300% higher in cost than if done as original work. Notwithstanding the fact that for a slightly increased appropriation for the electrical work a thoroughly complete job could be had, the architect will not consent to add anything outside the ordinary run of work without approval of the owner. In apartment houses the electrical conveniences are largely gauged by the rental the owner expects to obtain from his prospective tenants. In buildings to be occupied by owners the electrical layout is largely dictated by the amount the owner is willing to spend. The latter is really the turning point of the whole proposition. In the case of other products which enter into the building the manufacturers have done a large amount of consumer advertising, thereby creating a demand on the part of the public which must be satisfied by the architect. One of our big problems is, therefore, the education of consumers so that they will demand electrical conveniences.

The standards of lighting have changed materially in the past few years. Increased street and

store illumination have raised the requirements of residence lighting. In order to best serve his client the architect must now provide for sufficient lighting properly placed, not only in the home but in the industrial establishment. New rules are now being formulated by the State Industrial Accident Commission regulating industrial lighting along the lines of the requirements in New York and other States. Certain standards of illumination per square foot are prescribed for industrial establishments, depending upon their needs. These same standards will naturally find their way into the homes and co-operation between the electrical industry and the architects will safeguard the owner against expensive alterations.

The consumer knows very little of the safety requirements of the Accident Commission from the standpoint of the electric power installation. A proper study of industrial problems by all parties interested will insure a speedy solution of the difficulties and the development of adequate protective measures without prohibitive cost to the consumer. It is indeed a shock to the owner to find that an installation, perhaps just completed, does not comply with the Accident Commission's requirements and must be changed at considerable expense to him. The proposed new requirement of emergency lights placed ahead of the main switch in industrial plants is an illustration of the saving to the owner in having his needs known and provided for at the outset.

With the new conditions imposed by war, the general unrest of labor and the tendency toward Bolshevism, we are necessarily becoming more and more self-sustaining. We must do more of our own work ourselves. The advertisement for a servant is not productive of the results it once was. This condition will no doubt be more or less permanent and we must recognize the changed order of things. The electric washing machine, vacuum cleaner and similar appliances that lighten the labors of the housewife are going to become extremely popular. A great number of women who have filled the places of men in the service are now returning to domestic life. These women, accustomed to labor-saving devices in their industrial occupations are going to demand the same sort of efficient methods in their home life.

It is the obligation of the architect to provide for this new condition and the job is big enough to require the combined efforts of all the electrical fraternity in conjunction with the architect.

Aside from the strictly utilitarian need of the present, there is nothing more conducive to happiness in the home than the plentiful use of electricity. In our business life we see to it that the most up-to-date methods and appliances are taken advantage of—why not show our wives the same consideration by helping them do their work efficiently. A forceful illustration of this occurred recently in a small near-by town. The salesman for an aggressive contractor-dealer was endeavoring to interest a woman in an electric washing machine. She was convinced of its advantages but the salesman would have to see her husband about it. The

interview with the latter was not going at all well—the salesman was abused in every way and finally ordered from the place. "I will go" replied the salesman, "but before doing so I am going to tell you what a selfish proposition you really are. Over by the barn I see you have an expensive tractor. Your food-chopper and cream-separator are both motor operated. That hay-stacker saves you a lot of work. Now why shouldn't you give a little consideration to lightening the work your wife is compelled to do. Good day." Not ten days afterward this same farmer called at the dealer's store and apologized for his actions and said the remarks of the salesman had set him thinking—and he bought the washing machine.

The first requirement for the use of electrical appliances is, of course, an adequately wired home. The difference in cost between the ordinary wiring job and the one which is complete in all details is so small that it will cut little figure in the ultimate cost of the residence. New buildings can be taken care of by the plan which is suggested. There remain, however, the great number of houses which are at present inadequately wired. But this is a condition which is largely up to the contractor-dealer to correct and is one of his opportunities, which has been covered in another paper.

The Architect Will Also Benefit

All business of the present day is striving to give service. The architect must show his client this same service.

The building restriction during the war has resulted in congestion of living conditions which will greatly stimulate building operations just as soon as the labor and material markets will justify. Now is the proper time for the architects and the electrical industry to improve the opportunity thus offered to see to it that the new residences and business buildings about to be erected are adequately equipped from an electrical standpoint. Far too many specifications now consist about of the following: "The wiring of this building shall be done with rubber-covered wire and shall pass inspection." One does not have to look far for examples of poor specification work. Perhaps in an office-building the question of the switchboard has been handled as an afterthought, with the result that insufficient space has been provided, perhaps considerable additional conduit work is necessary, etc. A specific illustration of this was seen recently in a large building in which the switchboard, upon which were mounted open switches, was placed about three feet directly in front of the elevator. Not content with this trap the two feet back of the board had been well filled with steam pipes. A more dangerous location, front and rear, could not have been found. Needless to say this owner is having an expensive job in complying with the Accident Commission's requirements



OLUNTEER — don't be forced

—Victory Loan

which should have been avoided. The isolated plant in a hotel building, for instance, which has not been designed by a competent engineer, usually offers the most glaring illustration of poor engineering practice to say the least.

In planning illumination the average architect is weak because he is not acquainted with the fundamental principles involved. He will usually welcome assistance on this, however, because in the average structure the resultant illumination, plus the switchboard, wall switches and receptacles is about all the owner sees for the money expended. Where certain standards of illumination are required by law as in the new proposed code, the architect will be compelled to work on a more scientific basis than he has been accustomed to.

The question of heavy wattage appliances is one which must be given consideration in the wiring layout. For residence work the possible installation of ranges, water-heaters, air-heaters or any device consuming more than 660 watts should be provided for. In industrial plants the list includes furnaces, tempering-baths, drying-ovens, etc.

The Electrical Utilization Safety Orders and the National Electric Code are closed books to the architect, and he, therefore, welcomes a disinterested party who is willing to keep him from making errors in the application of these rules. When one says the National Electric Code it must also be taken into consideration that all of the larger cities have made amendments thereto and these are to be considered when talking to the architect. He is also, as a rule, glad to hear of new applications of electricity, particularly anything which will tend to reduce the cost of maintenance in the building. In the planning of a residence he is usually willing to take up with the owner the question of proper provision for electrical appliances, but the final decision invariably rests with the owner.

This is the day of specialization. Developments are coming so fast in the electrical field that we are busy keeping up with them. The field of the architect is one of the broadest in the engineering profession and he cannot hope to keep up-to-date on the details. How often have we gone into a home or business establishment and upon seeing a poorly planned job, whether from the standpoint of plumbing, electrical work or what not, inquired, "Who was the architect?" He is immediately blamed for all the shortcomings of the building. For the sake of his own reputation the architect should welcome a concerted move on the part of the electrical industry to help him. He would thereby be assured of complete and reliable information on the subject of the electrical requirements and the assistance he would be given would insure his client of a thorough and adequate installation.

The Central Station Can Better Serve Its Consumers

It might appear that in advocating the growth of two sockets the central stations are actuated by a purely selfish motive, which is not the case. The central stations advocated the use of lamps of higher efficiency when this policy made a distinct reduction in their revenues. The public has been benefited

thereby as it always is by any plan which makes possible a more general use of electricity.

A proper co-ordination of all interests will result in proper wire sizes being used, hence enabling the central station to render the best possible service. The proper location of meters from the standpoint of accessibility will affect the central station's cost of service—and rates are based upon cost. The contractor-dealer having installed a creditable job should see to it that his customer is provided with the necessary electrical appliances to round out a satisfactory installation. It naturally follows that more lighting and appliances will be used on a well-appointed installation, resulting in increased revenue plus a better satisfied customer. The absence of a socket in the place where one should have been installed is a source of constant inconvenience to the consumer and a perpetual loss of revenue to the central station.

The Manufacturer's Obligation

The rapid development along electrical lines makes it necessary from the consumer's standpoint that steps be taken which will insure to him the benefits to be obtained from the use of such developments. The plumbing interests have seen to it that the need for their wares is recognized and the result is that when an appropriation must be cut down on a building the plumbing specification does not suffer—while it is almost a by-word with the architect that the electrical work can be cut.

The work which has been done by the electrical manufacturers in conjunction with the architects has proven conclusively that such work is of great benefit to all concerned. A case in mind is that of a rural high-school building in which the electrical work as originally laid out amounted to about \$700.00. By a careful study of the needs on the part of a competent engineer the appropriation was increased to \$2100.00, which gave the school nothing but what was actually needed and created satisfaction and pride to the entire school district in a well-equipped domestic science department.

The Jobber's Part

Any move which will benefit the electrical industry, as this one certainly will, cannot help benefiting the electrical jobber. It will enable him to render a better service to his customers. With the merchandising of appliances done largely by the dealers instead of by the central stations, as in the past, it will become more the function of the electrical jobber to push the sale of such wares by assisting the dealer in his merchandising efforts.

Many excellent wiring devices are now being put on the market by the various manufacturers; devices which are unknown to the average contractor and which will materially assist the appliance game. Educational work must be done by the jobber in acquainting his trade with the particular advantages of these devices.

The Contractor-Dealer

Should the contractor-dealer in his zeal to land the job install but one socket where there should be two, both he and the owner will suffer. Present-day

conditions will require, sooner or later, the two sockets. If he installs them at the outset he has done a good job and it is hoped has received a fair price. If he did not install them both it is very likely the young hopeful of the family will purchase a few feet of lamp cord and a coil of tape and make the installation himself with all of its attendant hazards and the contractor-dealer will have lost revenue and the owner suffers by not having his needs properly cared for.

The average contractor does not have sufficient time to do much in the way of specification writing. His work would be greatly facilitated if he had a clear and concise layout of the job he is figuring. There would not be the chance for misunderstandings that are possible with an incomplete specification and the result would be a smaller item for contingencies in the bid—a bid which would insure the owner that he was getting a satisfactory installation, and which would also give the contractor a fair profit.

The various regulations which have been enacted, such as the safety orders and the electric codes are for the benefit and protection of the owner and the contractor should endeavor to comply with these requirements instead of, as is too often the case, try to find ways of evading them.

With a large number of central stations discontinuing the free renewal of lamps the opportunity of the dealer is great. He must be alive to his opportunities and do his part in increasing the use of electricity if he hopes to profit by the additional sale of lamps brought about by this condition.

One manufacturer of electric washing machines has announced that his production has reached the point of turning out a machine every three minutes. The wide-awake dealer is going to reap a big reward from the sale of these machines—and it will be a much easier task to land the prospect for a washing machine or other electrical appliances in a home where the question of additional wiring does not have to be raised.

A closer co-operation between the contractor and the architect will smooth out many of the points of friction that now exist. If he will deal with the architect in questions arising such as changing the location of outlets and switches instead of taking the matter up with the building contractor the owner's interests will be better protected. The architect is the owner's agent and will see to his interests, while the building contractor has no such incentive and is too apt to authorize changes which will mean a saving to him at the expense of the owner's convenience.

The following extracts from a report presented at a recent meeting of the Minnesota State Association of Electrical Contractors and Dealers shows that this matter is being given general consideration and offers specific recommendations which might well be followed on the coast:

MINNESOTA RECOMMENDATIONS

Objects

A. To raise the standard of plans and specifications issued by architects and engineers.

B. To educate the architects to an appreciation of fair and just charges on percentage contracts.

C. To better the working conditions with architects in the matter of form of contracts, allowing reasonable time for installing work, allowing additional compensation for overtime work, miscellaneous charges against the electrical contractor by the general contractor, etc.

Plans and Specifications

1. It should first be recognized that the architect is not equipped by either his training or experience to prepare plans and specifications for the electrical construction work in the more important class of buildings, but should employ the services of a competent electrical engineer for such work.

2. For small and medium size residences and other small work the committee should prepare a model specification for architects' use, accompanied by a discussion calling attention to the more important matters, giving data required for specifying high-grade work, and advice on the installation of switches, plug receptacles and special outlets.

Bettering Working Conditions

(See article by F. W. Lord in *Electrical Merchandising*, November, 1917, p. 240.)

1. Form of contract.
2. Terms of payment.
3. Miscellaneous charges by the general contractor against the electrical contractor.
4. Definition of "Cost."
5. Allowance of reasonable time for installing work.
6. Compensation for enforced overtime work.
7. Compensation for extra cost of labor when only small sections of floor slabs are made available for installing work at one time, and when work on a concrete floor cannot be made continuous from point of starting to point of completion.
8. Duty of plaster contractor in finishing at outlets.
9. Responsibility of other contractors for damage to electrical conduits and apparatus.
10. Responsibility of some definitely named person for accurate information regarding building lines and partition locations required for laying out work and compensation for changes made necessary by faulty laying out information.

Conclusion

It appears, therefore, that a real service can be performed to the benefit of all concerned by this closer co-operation. The consumer will have his needs analyzed and cared for at a minimum expense to him; the architect will be greatly assisted in his dealings with his clients; the central station can serve its consumers to the best advantage; the manufacturer, jobber and contractor-dealer can all better serve their customers.

The next thing to consider is how best to bring this about. The success of the plumbing industry which has been referred to is due in no small measure to the campaigns of individual plumbing manufacturers, first in consumer advertising and second in specification work. The first of these is being done pretty generally now by the electrical manufacturers. The missionary work which some of them have done has met with very gratifying results. If this policy were adopted by electrical manufacturers generally the architects would soon have the same appreciation of our industry that they have of the plumbing industry.

Calling on architects promiscuously for the handling of specification work is only about 20%



ETERANS don't quit during battle

—Victory Loan

efficient. The only way in which this can be successfully done is by following definite prospects where one can work on both the owner and architect. It is absolutely essential that the one writing the specification handle the entire problem; that he gather information with regard to the service location, handle the signal system, co-operate with the telephone company with regard to the placing of their facilities, size of raceways and cabinets. In order to protect the specification which he has written it becomes necessary to undertake the inspection of the work. In this he must be prepared to maintain, provided the job is of any size, a more or less continuous supervision, which means that he must see the job when the contractor starts work, at least once during the progress of the roughing, when the roughing is completed and when the finish is in place. It is to be remembered that when one undertakes specification work the person is really acting as a consulting engineer to the owner and architect and cannot dodge any of the responsibilities. This work is, therefore, more or less costly.

One manufacturer has recently issued a very complete treatise on illumination with numerous specifications of installations already made, covering the lighting of all types of structure. Such a book is very valuable to the architect. This plan could well be followed by other manufacturers on information pertaining to their wares, and if properly presented to the architect, would be exceedingly helpful in this campaign.

For small residences standard sets of specifications should be prepared which could easily be applied by the architect. For larger residences, office-buildings, etc., a careful study should be made by a competent engineer and plans and specifications worked up by him to fit the requirements, eliminating the necessity for expensive extras or alterations after the completion of the work.

Consulting electrical engineers are sometimes called in by the architects to assist them on large installations. This practice should by all means be encouraged and where such relations exist care should be exercised by any manufacturer doing specification work that such relations are not disturbed.

This plan, if generally adopted by the manufacturers, will produce good results so far as it goes. But it should be supplemented by a well co-ordinated campaign conducted by a neutral body, representative of all the various branches of the electrical industry, such as the California Electrical Co-operative Campaign.

If the individual handling this work for the committee attempted to write specifications, with the necessary inspection involved, he would be able to cover such a limited area that it would be impracticable. Again, the co-operative man cannot write definite specifications tying up work to specific devices because he serves so many masters. The best results from a co-operative standpoint are to be secured by a practical as well as technically trained man who does not write specifications, but who will act as technical adviser to the architects. For instance, he will tell the architects about bell-ringing

transformers and how they can be used, but he would not recommend or specify any particular make. He will bring to the attention of architects the line of equipment needed in various structures, tell why the equipment is needed, and where and how it should be installed. This representative must needs have a very wide practical experience in the building industry as the architect is not inclined to listen to the man who is strong on theory but weak on practice.

The point of entrance for this man should be effected by means of a circular letter campaign, which should be timed so that the subject will be fresh in the architect's mind when the missionary calls. He should frequently appear before meetings of the local architects' chapters and give the members the benefit of his specialized knowledge. New wrinkles, such as providing burglar lights on the exterior of residences, controlled by a master switch in the owner's bedroom, suggested.

The engineer should be given sufficient mandatory powers by the electrical body to whom he is responsible to enforce the compliance by the electrical contractor with the specification to the end that the contractor who attempts to "skin the job" be compelled to make an honest installation.

By such a co-operative move we can well justify the position that the exchange of our goods, our service and our ideas for profit is legitimate and ethical, provided that all parties in the exchange, and not least the consumer, are benefited thereby.

Recommendation

It is the recommendation of the Commercial Committee that electrical manufacturers so far as practicable, assist the architects in specification work and that the Advisory Committee of the California Electrical Co-operative Campaign be requested to work out a definite plan of co-operation with the architects on behalf of the electrical industry as a whole, submitting it for the approval of the Executive Committee of the Pacific Coast Section, N. E. L. A., the Executive Committee of the California Association of Electrical Contractors and Dealers and the California Section of the Electrical Supply Jobbers Association. It is further recommended that when the plan in its original form, or as it may be amended, has been approved by these organizations that they instruct the Advisory Committee to proceed with its execution, at the same time arranging with their individual members for sufficient increased subscriptions to the co-operative campaign fund so that the Advisory Committee will be enabled to properly finance this additional activity.

ELECTRICITY IN BERLIN

Owing to the present coal shortage in Berlin the use of gas and electricity is permitted only between 9 A. M. and 6 P. M. and the total amount may not exceed 50 per cent of the amount used in 1916. Motion picture houses may show pictures only between 6:15 and 10:15 P. M. Living rooms and bedrooms in private dwellings may have only one lamp of fifty candle power or two of thirty-two each. Superfluous lamps must be removed from their fittings.

Selling the Idea

BY H. L. HARPER

(The customer doesn't buy the metal and cord, but the service which he expects the appliance to render—and it is this "result" rather than the concrete object which the electrical merchant must sell. This idea is to be carried through every type of electrical salesmanship, from the central station to the retail dealer, as is pointed out by the author who is Los Angeles manager of the Western Electric Company. The paper is part of the Commercial Section report at the coming Coronado convention.—The Editor.)

Is it not a fact that through the rapid development of the electrical industry we have centered our thoughts more upon the engineering and the development of our products than upon successful commercial methods? If this is true, is it not natural that we have in our dealing with the public dealt more with the technicalities of our business than the service we have for their use? Have we not lead them to believe everything electrical is more or less mysterious, and that anyone in the electrical business, whether a clerk, chief engineer or general manager, is a wizard and an "Electrician"?

Mr. Electrical Man, every time you make a customer believe the electrical business is extremely technical, you encourage him to place more and more reliance in the advice of anyone in the electrical business, no matter how incompetent he may be. Your customers are liable to have as much confidence in the statement of one of your wiremen as in the advice of one of your officers, sometimes more. Your wiremen become second Thomas Edisons, and absolute authorities on all electrical questions and, of course, are usually considered friends of the people. It is only too apparent how much damage can be done to the industry by an uninformed employe.

Would it not be well for us to study our present selling methods, to determine whether or not they are conducive to the greatest results? Are we selling "The Beneficial Result" of our equipment, or are we selling the merchandise itself?

YESTERDAY'S STYLE OF SELLING WON'T DO TODAY.

THE CRY IS FOR 100% METHODS.

CONVERSATION AND ORDER TAKING IS NOT SALESMANSHIP.

Selling Human Ideas

You ask what are improved commercial selling methods. They are many, but I am going to attempt to speak of but one fundamental idea, not new, but many times overlooked. "Selling The Idea," rather than the article itself.

Before the days of so-called "salesmanship" based upon the study of successful selling methods, it never occurred to the average salesman to sell anything except the merchandise itself. In other words, he spent his time selling steel, glass and the materials of which his goods were made. He was trained to know his products from the ground up, which although a necessary attribute of salesmanship, did not get him far enough.

In the meantime, merchants awakened to the fact that merchandise of quality could be purchased in many localities, from many firms, and that there were other phases to the question of buying and selling, such as advertising, trade demand, profit and turnover. Gradually, the wise salesman worked

away from the prosaic, dry-as-dust arguments about the goods themselves, presenting instead the customer's viewpoint, pictured real human ideas and gave vivid descriptions of what the merchandise would do and its effect on the buyer.

For instance today, the scale salesman does not sell so many pounds of glass, gilt, springs, rods and weights. He sells the merchant "The Idea" of an accurate accounting system, "The Idea" of eliminating overweight and of losing customers through giving underweight. The banker does not buy an adding machine because it has so many red and green buttons and makes a good appearance in the bank; he buys less labor, accuracy, time and money saved and quicker and improved methods. The Kodak people do not sell a camera; they sell the Witchery of Kodakery—"The Idea" of picture making. The Phonograph people do not sell a fine cabinet, spring motor and intricate mechanism for reproducing vibration. They "Sell The Idea" of ready-made music. The real estate promoter does not sell a quantity of brick, mortar, joists and shingles, but "Sells The Idea" of a home. By "Selling The Idea" or "The Result" of electricity, the public will learn that our business is not so mysterious as they now think and when that point is reached, our field will be broadened.

Salesmen—Not Demonstrators

Salesmen seldom have to sell a person the things they need. Anyone will come around of their own accord and buy these things because they simply have to have them. While a person's needs are few, his wants are many. The want is what lifts human beings above the plane of savagery. Primitive people want only what they need, animals are the same. Catering to the wants distinguishes civilization from savagery. Salesmanship consists of selling persons what they want and magnifying their wants in such a way that they simply cannot get along without them.

Two business men were talking about a certain salesman. One said: "He is a good man alright, but he is a demonstrator, not a salesman." I was struck with the idea and its applicability to the subject under discussion. So many so-called salesmen are merely demonstrators, all they do is to show goods. They are good demonstrators,—even passing fair dummies,—but that is all. The customer has so often to sell himself and give his money to the so-called salesman. That is not selling, it is or-



OTE for your self-respect

—Victory Loan

der taking. You might hire boys for such jobs instead of men. Do not let your sales people become demonstrators, or, if they are already, do not expect them to sell, but secure real salesmen to get the names on the "dotted line."

Experience with the Electric Range

At a convention of the National Electric Light Association held in Chicago when the electric range first attracted attention, the question of presenting "The Idea" instead of the product itself drew forth a great deal of comment. When the successes of the various reporting companies were analyzed, it was found those who had merely been selling electric ranges and had talked sheet iron, castings and heating elements made up in the form of electric stoves had not made much progress, whereas those who had gone out and talked "Brighter and Happier Hours in the Kitchen" and "The Idea of Electric Cooking" had reaped a harvest. The whole thing was summed up by a Manager, who said, "Gentlemen, for some years to come, electric ranges are going to be sold, not bought," and he was right. To sell ranges like many other things, enough imagination is required to look beyond the merchandise itself and so visualize what it will do for the buyer and so picture its effects that she or he will want the article.

Using National Advertising

I would like to tell how a most enterprising electrical salesman in a middle west city makes use of national advertising by "Selling The Idea." He keeps an eye on the magazines and when he sees an advertisement of the goods handled by his company, takes a copy of the publication and calls on that portion of his prospects who are likely buyers. At the time of his visit the first question he asks is whether they have read the current issue and noticed the advertisement. He says, "I am not keen for trotting up to a prospect's house with a cleaner under my arm like a broom or brush peddler. I slip a magazine into my pocket and when I get to the door, I ask the lady of the house if she has read the publication, which almost invariably gives me a satisfactory introduction, and a foot inside the door. In other words, I first get her attention by talking about the magazine and the advertisement, after which I endeavor to intensify her interest into a desire by talking about "The Result" the device will accomplish, and what it will do for her. I keep her attention riveted on the point of making her housework more pleasant and never talk cleaners until she is ready for a demonstration. I used to try to sell cleaners by picturing my articles so glowingly that other cleaners would look cheap by comparison, the result of which was, I frequently was trapped into an argument about the different kinds of cleaners, which was sometimes fatal. To talk about the mechanical parts of a cleaner is a waste of effort. It is not the shiny nickle or the fine flexible hose, it is the fact that it will separate her from the toil and drudgery she has been experiencing in an effort to keep her home bright and cheery. That's the big "Idea," sell her on that, and she will buy any article of merit that will help her in her work.

If Advertising Ceased

What would happen should all advertising on "Selling The Idea" of electricity cease? Is it not logical to assume that the gas engine people would take advantage of such a situation and sell their product where motors are now being used? Would not gas companies promote their product for lighting? Now, if you don't think this has some merit, take a look at the lumber industry. I was very much surprised at the contents of an article in the November 3, 1917, issue of the Saturday Evening Post, that in part stated:

"Twenty years ago the owner of timber was regarded as a partner in an ironclad monopoly. The supply was limited and the demand rapidly increasing. As a broad proposition the timber owner had merely to wait until demand came to him and paid him his price.

A late report by the United States Forest Service shows that for years substitution of other materials in the place of wood has been increasing, until it now amounts to more than five million board feet a year. Shingles have given way quite largely to composition and tile roofing; wooden sidewalks have been almost wholly replaced by cement, and so on.

Disregarding temporary conditions created by war, the effect of the growing use of other materials has been to accentuate competition and decrease profits in the lumber business. Approximately seventy per cent of the lumber goes into forms of use whose demands appear to be decreasing, twenty per cent goes into strongly competitive fields. On the whole, lumber men have failed to adopt aggressive selling methods. Manufacturers of other building materials have spent large sums of money to obtain reliable information about their products and advertised extensively to make a place in the sun for themselves. Substitutes for lumber are guaranteed to meet specifications, which are easily understood by the consumer."

It is of interest to know that since this article appeared, lumber producers, especially the Southern Pine Association have advertised quite extensively the idea of using lumber.

What better evidence do we need that it is up to each and everyone of us, Central Station Operator, Contractor-Dealer, Jobber and Manufacturer to promote our business on a sound commercial basis and that it is our duty to give something to, and not altogether take from, the industry. Therefore let each of us resolve to make a study of our own commercial practices and adopt a policy of "Selling the Idea" or "The Beneficial Result" of electricity instead of so many pounds of copper, steel and brass.

ALL-CHINA EXHIBIT

It is stated that China's President is planning to hold an all-China exhibition at Nanking, after the constitutional strife has been settled by the peace conference now sitting at Shanghai. Telegrams will be sent to the Chinese representatives in foreign countries inviting them to have their countrymen prepare exhibits, especially of machinery, aeroplanes, submarines, and scientific equipment new to the Chinese public at home. The Chinese handicraft turned out in the republic will be a special feature of the exposition. The exhibition should interest foreign manufacturers doing business in China, as it is an unusual opportunity to see the products of this vast land of 400,000,000 people.

Progress of Electric Cooking and Heating

BY BEN M. MADDOX

(Electric cooking is a load which is being encouraged by western central stations. The conditions which make it a profitable addition to their business and the factors which enter into the sales problem are here discussed by the vice president of the Mt. Whitney Power & Electric Company. The paper forms part of the Commercial Section Report for the Coronado Convention of the Pacific Coast Section N. E. L. A.—The Editor.)

Electric cooking is not a new idea, but when first presented to a prospective consumer by a salesman who knows the convenience and comfort that can be realized from the intelligent use of the latest make of electric range, it seems too good to be true. None of us can remember when the first experiments were made in electric cooking, but some of us have a lively recollection of the time when there were no cooking stoves of any sort used in the average home. It was a great step forward when the fire place, skillet and Dutch oven was replaced by a wood stove, with its kindling, wet wood and ashes. The gas burner was a decided improvement over the wood stove, and now the last word is the electric range.

Introducing the Range

In the early days of electric cooking in California, several stations made more or less of an attempt to introduce ranges, but with rather indifferent success, due partly to the undeveloped state of the apparatus, partly to the rates and partly to the lack of knowledge and proper methods of handling the business. The Mt. Whitney Power and Electric Company of Visalia was one of the first companies in the State to make a serious effort to introduce electric cooking, water heating and house heating on a large scale. That Company in the year 1911 established a very attractive combination lighting and heating rate through one meter, which was applicable to residences installing ranges. No active campaign was started but a good steady effort was put forth to establish the business on a sound basis. The result was that though the Company served a total population of less than 35,000, within three years it had 200 installations, the majority of which were cooking, water heating and house heating. Special attention was given to keeping the devices in operative condition without cost to the consumer, though this proved to be a costly undertaking, due to the state of development of the apparatus at that time.

Easy to Extend Use

In November, 1913, a pamphlet was published by the Company for circulation at a citrus fair in which the merits of electricity for cooking were set forth. It contained letters from 38 consumers who had been using electricity for cooking and heating, some as long as four years. All were enthusiastic in their praise of the electric kitchen. In the spring of 1914 it was decided to discontinue the sale of electric cooking outfits, and nothing further was done until the fall of 1917, when a campaign was inaugurated to increase this load. To determine how the people who signed testimonials in 1913 felt about the matter, they were interviewed again, and without exception they were still satisfied.

When solicitors began work in 1917, it was the intention to put on 1000 ranges in one year. Orders were obtained without trouble, but the cost of transformers and the necessity for re-inforcing lines, together with the difficulty of getting material on account of the war, and an unremunerative rate, necessitated a change in policy, but the campaign lasted long enough to make it certain that if the rate for this service could be adjusted and other unfavorable conditions overcome, that it would be easy to add 1000 ranges within a year.

I asked the District Agents of the Southern California Edison Company to give me their opinion about electric cooking and heating and they were unanimous in saying that it was a success and that the users were satisfied. For safety, cleanliness and thorough cooking of the food, the electric way cannot be equaled by any other form of heat. The fact that an electric kitchen can be made as attractive as any room in the house appeals to the good housekeeper.

Interest Growing

Within the last three years a number of stations throughout the country, and especially in the West, have become interested in electric cooking. This is due to several causes, to-wit: The apparatus is being improved; the cost of other fuels has advanced; the manufacturers have made a concerted effort; and as other fields have become more and more saturated the domestic load has appeared to offer the next best opportunity for increased business. As a result attractive rates have been established and during the years 1916 and 1917 very great progress was made; but owing to war conditions 1918 was not what might be termed a satisfactory year, though in the early months a considerable amount of business was secured.

As stated above, electric cooking is now an established fact, and the station that does not encourage it actively is overlooking a very productive field. The possibilities are unlimited. In reality every residence and every hotel and restaurant accessible to the lines is a prospect and by proper encouragement can some day be made a producer of revenue from cooking and heating. It is largely a matter of rates and service. A very large proportion of the population of today realizes the superiority of electricity for cooking and heating purposes, and are only deterred from using it on account of the rather general impression that the service is expensive; but



ANQUISHING the enemy was no joke—
why hesitate at your share?

—Victory Loan

where it is possible to show the electric method is not very much more costly, it is usually a simple matter to secure the business.

The Importance of Water Heating

A number of central stations have contented themselves with trying to install ranges only, entirely overlooking the matter of water heating, which is equally essential to the housewife and a good source of revenue to the station. In order to bring out this point more forcibly it may be stated that the consumer is generally sold on the matter of convenience and cleanliness. She is told of the great saving of labor due to the absence of fuel with its attendant dirt and danger, while every one knows that a good supply of hot water is absolutely necessary to comfort and convenience. Therefore, if the coal or wood stove is removed without provision for water heating the customer is apt to be soon dissatisfied because she has no hot water other than that which can be heated on top of the stove, which is very expensive and slow and is the cause of a great deal of dissatisfaction. If, as has been the practice of a number of stations, some other method of water heating is installed that uses fuel and the old stove is retained on account of its water coil, the consumer has still to make fires and handle fuel and she has, therefore, not accomplished what she expected and in many cases is disappointed. Now the logical method would seem to require the active encouragement of water heating and kitchen heating as well as cooking, in order that the service may be real and all that was expected. It therefore only remains for the station to establish such rates and conditions as will make the cost of this service somewhere near comparable with other fuel to open up a very large and productive source of business.

My experience and investigation leads me to believe that the 3500 or 3600 watt circulation tank heater fills 80% of the demand for water heaters today. The automatic type of water heater is used only when a continuous supply of hot water is required. The 3600 watt circulation water heater connected to 18 gallon tanks properly lagged is the most economical and most satisfactory water heater for the average bungalow, but a 30 gallon tank is found in the majority of homes, and the 3600 watt heater is used, as it gives perfect satisfaction, but is not as economical or quick as the 18 gallon tank installation.

Improvements Needed

It is very necessary that something should be done to improve the material and construction of ranges. Ovens rust out quite frequently and this is a constant source of annoyance to the consumer, as well as the central station. Bricks upon which the element is wound, crack and break, often. Thermometers are inaccurate. Frames of ranges are, as a rule, very light and poorly finished. Elements should be built that give the service that our consumers expect. No great number of electric ranges will ever be sold without these very necessary improvements.

The maintenance of electric ranges is a question that has received considerable discussion of late, and

some are of the opinion that the central station should furnish replacements of burned-out elements at actual cost, and install same free of charge after the guarantee has expired. Many are of the opinion that the renewal of elements after guarantee has expired should be sold to the consumer at list and install same free of charge. Others believe that the manufacturers should extend the guarantee on elements as long as the central station must stand the brunt of the up-keep and repair of ranges. This is a question that must be reckoned with in the very near future, because, as the time goes by, the trouble multiplies.

Questions to be Settled

It is the consensus of opinion that there are entirely too many types or styles of ranges handled by the central station. In the first place, it necessitates the investment of a very large sum of money and, naturally the depreciation of shop-worn ranges, and the expense of handling so many styles, amount to quite a large sum of money each year, and the fact that it takes twice or three times as long to sell a range where there are so many to select from. It does away with so many different opinions among housewives as to which style or type of range is the most suitable. It will save one-half the salesman's time, and cut the cost to the central station of handling this business, at least 20%.

From the Central Station standpoint the rate is of first importance. It must be high enough so that those who use electricity for cooking will pay their just proportion of the fixed charges and operating expenses. In making rates, the Commercial Department may have had too much to say in the past, but in this day of scientific rate fixing, the engineer must be consulted. It is not possible to take on much of this business without the expenditure of a large sum of money in reconstructing lines that were not intended for this service when originally built. Close regulation is necessary, for the lack of a few volts may make all the difference between a satisfied or a disgruntled consumer.

Another question that will cause some thought is whether the Central Station or the Contractor-Dealers shall sell the range and waterheater. If the Central Stations give up the business, then there must be the closest co-operation between the local dealer and the power company, and it is very doubtful if this can be brought about. There will be on every system localities where such additional load can be taken on without much expense, while in others the cost will be prohibitive. The man that makes the sale must know about this before he makes a proposition to place a range. On the other hand, it requires a large amount of money to buy stock in such quantities that the greatest discount can be secured. The cooking and heating load has been obtained so far only by the Central Stations financing the campaign and using its own men to solicit the business.

If the Man Kept House

The Central Stations have a monopoly in most of the uses to which power may be applied. For

the man, no argument is required to convince him that his interests require electricity in the factory or on the ranch. Whenever the so-called Lord of Creation finds the need of energy to operate any machinery he is called upon to keep in motion, he specifies electricity. It is the twentieth century way of doing things and that is the end of it. It has been somewhat of a struggle to convince the average man,

however, that the home should receive the same consideration that is given a rock quarry, planing mill, packing house or pumping plant. It is thoughtlessness, or selfishness in many instances on the part of the man, and I have often wondered how long it would be until electric ranges were installed in every home that is adjacent to an electric line, if the man had to do the housework.

The Contractor-Dealer of Tomorrow

BY JOHN C. RENDLER

(The possibilities within the grasp of the contractor-dealer are unlimited. Suggestions as to the immediate fields which may be conquered by both the contractor and the retail merchant are offered for practical consideration by the president of the Southern California Electric Company as part of the Commercial Section Report of the Pacific Coast Section N. E. L. A.—The Editor.)

"There is a tide in the affairs of men, which taken at the flood, leads on to fortune;
Omitted, all the voyage of their life is bound in shallows and in miseries."

On such a full sea are we now afloat, and we must take the current when it serves, or lose our ventures.

How well the words of Shakespeare will apply to the Electrical Contractor-Dealer of Tomorrow, time alone can tell. Are we ready to take the current when it serves? I say we are. In order to more clearly define the scope of the "contractor" from that of the "dealer" and because there is a distinction between the two, I am going to deal with them separately.

The Future Contractor

The Contractor of Tomorrow is a man neat and clean in his personal appearance, his associates are architects, building contractors, and proprietors of commercial and industrial businesses. He will have a thorough knowledge of his business, its possibilities for development, expansion and opportunities. He will use only highgrade materials and employ good machines, because no business can progress on any other principle.

The contractor will consider his vocation worthy and as affording him an opportunity to serve society. Society demands honorable business methods and unless a business is constructed on such a foundation, all of our ventures will be lost. We will associate with men who compose the other branches of the industry, make our dealings with them, as also our competitors, on an ethical basis, thereby retaining their friendship, have access to their council and advice, keep abreast with the times, particularly in our own industry, then, and not until then, take the current when it serves.

Residential Work —

In residences and apartment houses, too little attention has been paid to correct illumination, wiring for lamp socket and heavy wattage appliances. We so often find a residence in which the wiring has been poorly laid out. The general illumination is not sufficient for the room, the color of the walls and ceiling have received no consideration, the fixtures are selected from the standpoint of beauty and price rather than efficiency, and a harmonizing effect. The

switch locations are placed at the most convenient place for the contractor, rather, than for the consumer. I have seen some very fine residences and apartments, recently constructed, with no provision for the many labor-saving, lamp socket devices. Here the Contractor of Tomorrow will demonstrate his knowledge. No residence or apartment house will be wired by him, or under his supervision, that does not have provision in every room for a plug, of sufficient capacity for 660 watts. In addition to these, provision will be made for the special plugs to care for the washer, cleaner, iron, toaster, percolator, and the curling iron in Madame's boudoir. A few other important provisions should be made. No modern residence or apartment owner, will be permitted to overlook the necessity of providing for the electric range, water heater, or large air heater. While these electric devices are prohibitive in some localities at the present time, there is no doubt in my mind but that they will be as universally used as the electric iron, and in a very short time. Special care will be given to the wiring of all lamp sockets and heavy wattage appliances, to see that the circuits are wired heavy enough to carry the full load, proper fusing facilities, and entirely separate from lighting system. The time to have these provisions made in the wiring is, before the plans leave the architect's office, therefore the contractor will lend every effort, to see that the architect is fully conversant with the advisability, and necessity, of providing base plugs and special outlets. While I have used the residence and apartment house in my discussion, the same condition holds true to quite an extent in office buildings and to an even greater extent in some.

The Industrial Field —

Here the contractor will grasp the opportunity, which for numerous reasons in the past, he neglected to take. By hard and consistent effort, both as to salesmanship and, a better understanding of their requirements, he will win back the thousands



ERBAL patriots can now prove themselves

—Victory Loan

of dollars in business that he has lost, on account of the industrials doing their own work.

Make a study of power and the relative values of it, so you can show the economy of individual drive on machinery over the long line shaft and belts that are largely in use today. Show the many advantages of electric drive over gasoline, or steam, to those who are still inclined to believe they have the best system of power. Show the manufacturer how he can increase his production, by better lighting in the factory general, and by properly lighting the individual machine. The safety of employees in the factory is very essential, therefore recommend and use necessary safety devices that will add to the protection of life and property. All motor maintenance will be done by the contractor, when he puts himself in a position to render service. A motor stopped in a manufacturing plant means the loss of time of one or more men, but this is small compared to loss entailed by the cutting off of the output of that machine. We must be ready to give instant service, make the repairs as quickly as possible, commensurate with good workmanship, charge a fair price for the labor performed and the material furnished, thus giving such efficient service that the ordinary industrial plant cannot afford to maintain its own electrical department.

Again, we have an opportunity to demonstrate the many advantages of heavy wattage appliances, this time in the factory. Electric furnaces, ovens, spot welders, glue pots and hot plates are all tried and proven devices, and an opportunity should never be overlooked to recommend their use.

There are one or two obstacles which stand between the contractor and the industrial business, which I firmly believe when the contractor shows he is making every effort to secure this business, that he is deserving of it, that the jobber will see the fallacy of recognizing every industrial as a trade buyer. The manufacturer of motors will discontinue selling their product direct to the consumer, and will revise their policy, allowing the contractor a sufficient margin of profit to warrant his doing the sales and engineering work. The contractor, who is not an electrical engineer may not be aware of the fact, that most power companies maintain a corps of engineers who will lend him, without charge, any assistance desired, in laying out new plants or remodeling old ones. The offer of this service should be appreciated and used advisedly.

Electricity on the Farm —

A large, new and undeveloped field is open to the electrical contractor in the use of electricity on the farm. I have a vision of driving out the country boulevard and stopping at the modern farm. The first thing we notice is the light at the entrance gate; as we drive in we find the yard and all the buildings are lighted on the outside. On entering the milking room we find that electric milkers are used exclusively, the building is well lighted, and motor driven conveyors are used for handling the milk and feed. In another small building we find the food chopper electrically driven. The separator, the

churn and ice-cream freezer are driven by motor, and in the laundry the washing machine and iron hold forth ready to perform their service at the touch of the button. In the barn, we find a motor connected to a hoist, for the purpose of raising the feed to the loft, or loading the wagon. All the wood is sawed by an electrically driven saw. The water the farmer drinks and that with which he irrigates his land, are pumped by an electrically driven motor. In fact, I believe the modern farmer has become so energized with the electrical idea that he is largely propelled by the thought of it.

What has been said about wiring, switches, base plugs and heavy wattage appliances for the residence and apartment house, apply equally as well in the modern farm house. In fact, the heavy wattage appliances are more essential on the farm, because in most cases gas is not available for heat or cooking.

In localities where there is no power available, another field opens to the contractor—that of furnishing farm lighting plants complete. I would not recommend one in a place where a Public Service Corporation could serve, because the private plant is limited in its capacity, requires more care, and the first cost is quite a factor. Also, the private plant cannot be operated as economically as the power company's service can be purchased. The possibilities, however, for wiring and motors in the private plant are similar, with the exception of their limited capacity. With the modern farm, having from one to ten motors, a good business in maintenance may be worked up by the contractor, and what has already been said about service, in industrials, applies equally well here. By all means make the farm wiring and installation comply with all state safety rules, even though it may not be inspected. With this tremendous field open to the contractor now, almost at its birth, he will do well to fit himself for immediate action, grasp this opportunity, for some one surely will, and let it not be a plumber or a blacksmith.

I have endeavored to cover some of the problems of the Electrical Contractor of Tomorrow, and to suggest solutions of these problems; it is now my purpose to enumerate some of the opportunities of which the Electrical Dealer of Tomorrow will take advantage.

The Dealer —

Considerable has been said about the electrical dealer as a merchant, all of which has been very instructive to him. I believe, however, that as he is young in a business way, he must, as a child, learn to crawl before he can walk. In establishing a location, two things must be borne in mind: First, the traffic or shopping procession; Second, the possibilities of the city's future development. These two things for permanency, as establishment in a particular location is a valuable asset to a merchant. A move is very expensive. The selection of a store, whether it be on a corner, or in the middle of the block, depends upon the rent, and more particularly upon the gross profit upon which you work in the

sale of your merchandise. The gross profit allowed the electrical merchant today does not permit of him opening a store in the heart of the shopping district.

A location being selected, "regardless of the district," too much consideration cannot be given to the furnishings. A carpeted floor, if possible, enclosed glass wall cases and show cases, to properly display merchandise and to keep it clean. The shelves where the small devices are kept, should receive especial attention, for there are a number of stores whose general good furnishings are marred by the appearance of their shelves. The store, wall and show cases should be well lighted, thereby offering the suggestion to your customers of better light. If the store arrangement will permit of it, I would have two windows, so that one would always be on display, while the other was being trimmed. To obtain the best results, a window should be trimmed once every week, concentrating in your display on one thing, rather than trying to show everything you have in your establishment. A valuable lesson has been taught to the dealer, which the Dealer of Tomorrow will take advantage of—that of stocking inferior merchandise and appliances. No appliance, device or merchandise, will be put on the shelves for sale, that does not carry the personal guarantee of the dealer. The time has passed when a customer, bringing in a defective article, will be told that it will have to be sent to the manufacturer for replacement. I firmly believe that had this policy been in effect for the past five years, the electrical dealer would today be doing 50% more business. The consumers finding that the electrical merchant's wares were no better, and his service poorer, they made their purchases at the hardware, department, and grocery stores on account of their convenience.

Next to highclass merchandise for sale, comes the necessity of highclass salesmen to sell it. A salesman will either bring repeat customers or drive them away. See that your salesmen are possessed of good personality, understand your merchandise thoroughly, are well dressed and neat in appearance, though not expensively; are kind and courteous, and your business will grow by leaps and bounds. Install a good delivery and repair service; it is necessary, as the customer has been educated to expect and demand these things. Join your Association, your Chamber of Commerce, your Rotary Club, or any other business organization that is interested in building up your city, and thereby take your place in the front ranks of your city's business activities.

Business Building —

A short time ago this part of the dealer's business was a puzzle of considerable moment to him. At each thought of some plan to build new business, he was confronted with the plan then in effect by the power company. He could not sell at their prices, meet term payment plans, or make repairs free of charge. Happily, this is a thing of the past, and the change is due to the efficient work of the Advisory Committee of the California Electrical Co-operative Campaign. The committee's work has been and is now along progressive lines, lending every opportunity to the dealer to take over that

part of his business which has been such a puzzle to him. Again I ask, "Will the Electrical Dealer take the current when it serves?" I answer, "He will." How is he to go about it?

He will advertise to the limit of his financial possibility, his name, his business and his location. Let me say here, that I do not believe it would be amiss if the manufacturer apportioned some of his National advertising fund for use in fertile local fields. Since practically all agencies for specialties and appliances are exclusive, and are distributed through an electrical jobber, he also should do local advertising in some form, either through the newspapers or by campaign, always referring to the dealers as his sales agents. The dealer will do seasonable campaigning, employing highclass salesmen to canvass the city, in the same manner as formerly employed by the power companies. The adoption of the term payment plan on the larger devices, is absolutely necessary, and properly handled will be the best business builder the dealer has. Advertise this feature of your business at all times. Select a good standard line that is well advertised nationally, and then show in your advertising why this commodity should be purchased from you, rather than elsewhere. Tell the public about your service department, your personal guarantee, your knowledge of things electrical, all of which will enable you to serve them better. Your window is your best salesman. Make use of it. Tell your story to the passerby so that he gets it at a glance, and once you get him in your store, good salesmanship will do the rest. We must get our name and business before the public, and in much larger type than we have been able to do in the past. The down-to-the-minute dealer is soliciting consumer lamp contracts. The lamp business is not only profitable in itself, but serves as bringing additional business from the consumer. The dealer's progressiveness will lead him into many fields in which the harvest is very poor now, among them the office building and some industrials. By his consistent effort and progression, the jobbers and manufacturers who are now serving this class of trade, will see the advisability of discontinuing their efforts, and leave the work and the business to the dealer. No jobber or manufacturer should solicit or accept a consumer lamp contract, when there are progressive dealers in the vicinity.

A manufacturer should not sell motors direct to the consumer, when he finds the dealer ready to perform the service that is necessary. In other words, when the dealer perfects his selling force to its highest efficiency, his only competition will be from his competitor dealer, and then on an ethical basis.

Accounting and Collections —

As we develop our business, its growth demands of us a better accounting and collection system. Adopting the term payment plan for selling



VALOR to the end from the boys — merely money from you

—Victory Loan

merchandise, without developing an accounting and collection system to handle it, would mean absolute ruin to the dealer. I would recommend a separate ledger for all term accounts, using a card follow-up system. Adopt a policy at once, allowing not more than two payments to lapse without taking back the merchandise. Notify your customer about five days in advance of date payment will be due. Try to get them to come to your store to make their payments—it means additional business to you. Use good judgment when sickness or accident prevent a customer from paying, but accept no fake story. If you have sold good merchandise at an honest price, you are entitled to be paid for it. Numerous failures are recorded on account of poor collecting methods, and the fear of hurting your customers' feelings, by asking them for what is justly due you. The accounting department should be kept so that you can get complete information regarding any part of your business. Your monthly report should be as complete as your annual report, with the exception of a physical inventory. The merchandise account should show you the number of times per year you turn your stock. Your sales account is your stimulator, and you are the stimulator for your organization. It also gives you the figure from which to make your advertising appropriations. It shows you the advantage of discounting your bills. You get a monthly comparison of one month with the next. Also, comparing a month with same month of the year past, you can ascertain if you are maintaining a steady growth. Each department should be kept separately, and bear its ratio of the general expense; in this way you know from where your profits are derived, as well as the source of losses. I know of a case where a department had been losing approximately \$350.00 per month for 2 years, and it was never found out until a good accounting system had been put in. I believe it is the best money a dealer can spend. Thousands of dollars are being stolen annually from dealers in this state, by sharp

bookkeeping practices and other schemes, nearly all of which could be eliminated by proper accounting systems. Have your books audited by an expert accountant at least once a year, and twice if you can afford it.

Another vital point of your business that is brought to your attention by a good accounting system, is your cost of doing business. You must constantly watch this important item, or your expense will grow without your noticing it. A good form for this is to have your bookkeeper list your overhead on a separate sheet in monthly order, so that at a glance you can see the comparisons.

The Consumer —

There is nothing so essential to the success of our business as the good will of the consumer. It is easy to discuss the progress of the contractor-dealer, the many new fields in which he has to work, and the planning of this work, but the success of it all is held in the hands of the consumer. We can obtain this good will only, by preparing ourselves to be generous in the extension of good will to others. Make as the main policy of our business, Honesty and Fair Dealing, inculcate this idea in the minds of our organization, advertise it, then by all means, PRACTICE it, and we will be doing justice to the consumer, to ourselves, and to our profession.

In summing up the possibilities of the Contractor-Dealer of Tomorrow, it seems to me, there never was a time in the history of the electrical business when opportunities such as we now enjoy were within our grasp. I should say it is now up to us to show that we are capable of handling the situation, of putting forth renewed effort, or re-energizing our selling forces, of establishing new forces to care for new fields, of living up to the claims we have made in our own behalf, and show in the words of Shakespeare, that, "On such a full sea are we now afloat" we will "Take the current when it serves" and so "Lead on to fortune."



A lighting installation 1800 ft. underground. This is the 1800 ft. shaft station in the Keystone Mine at Amador City, Cal., one of the oldest and best known gold mines in the state. This is a far cry from the candle-in-the-hat illumination and indicates how electricity is being utilized in our mines. There are 4-100 watt lamps in the reflector. The photograph, which was taken by E. R. Higgins, up to recently efficiency engineer with the California Metal Producers' Association, represents the effect of a 10 minute exposure.

Appliance Sales Policies

BY T. W. SIMPSON

"Shall the Central Station remain in the business of selling electric appliances, or shall it drop this business and leave it to the dealers? The author, who is western district sales manager of the Federal Sign System (Electric), presents a strong argument to prove that it is better for the prosperity of the dealers to have the Central Station remain in the business of selling electrical merchandise. The paper forms part of the Pacific Coast Section N. E. L. A. Commercial Section Report.—The Editor.)

Developing the load of the small consumer does not possess the glamor nor does it appeal to the imagination as does creating huge power and industrial loads, but it is equally important. A slight increase in the consumption of many thousands of residences and stores means a vast total of electrical load considered in the aggregate. As the development of this load is inseparably connected with the sale of current-consuming devices, it becomes the duty of all branches of the industry to study most carefully the best manner of interesting the consumer in the utility of these articles. No permanent interest will be aroused unless the fundamental policies are correct and therefore the first consideration of this paper is to analyze basic sales policies, after which follow suggestions as to application.

The Nature of the Merchandise.

A skilled merchandise manager of the type developed by modern department stores, if unfamiliar with electrical apparatus, would ask many pointed questions concerning electrical devices which probably have not been considered by many of us who live so close to the electrical business that we lack perspective. Such an investigator would quickly determine the following characteristics of electrical appliances which are listed herewith without argument as to their being good or bad, but because they have a bearing upon the determination of proper sales policies.

(1) Relatively High First Cost —

One cannot deny that a ten-dollar electric heater looks small compared with a kerosene or gas stove of the same price, and so on through the list. The electric article is usually high compared with its competitor.

(2) Considerable After-Service Necessary —

Those of us who have had thrust upon us the duty of "fixer-in-ordinary" of all the electrical devices in our neighborhood just because we are in the electrical business appreciate the important bearing that service has in keeping appliances in continual use. No permanently successful policy can afford to neglect this important feature.

(3) Few Staples—Many Specialties —

The merchandise expert regards a staple as something that partakes of a repeat demand and that is purchased solely for its utility. The only pure staples of the industry are the lamp and the fuse. Semi-staples are the iron and the fan, and owing to recent abnormal conditions, the washing machine. A fair percentage of the business in semi-staples comes from people asking for them. All of the other articles are specialties for which there is very little "call" unless it is for gift purposes. These

goods require forced methods of salesmanship, commonly called specialty salesmanship. To a degree the semi-staples also require this plan of selling.

For instance, a large drug company endeavored to sell electrical appliances of well-known makes by the usual methods that would move celluloid hair-brushes, by window and counter display and the results were very unsatisfactory. A large tea company endeavored to use a well-known line of appliances as a premium but found their wagon drivers received few requests, the women preferring sets of china dishes and the usual run of premiums.

(4) Published List Prices and Fixed Discounts —

The merchandise expert, knowing the nature of the goods as above suggested can easily devise means of selling which will move large quantities of them, just as he can move sewing machines or phonographs, but when he applies the "mark-ups" that his experience shows will cover the cost of selling, he finds a conflict with established list prices which to him do not provide a margin to make profitable a strong selling campaign.

For instance, the largest furniture store in a large California city reported that they handled vacuum cleaners purely as a convenience and because they desired to be able to supply all the casual demands of their customers. They refuse to campaign such a device because any such selling effort expended by them would have to go on lines carrying a profit margin able to pay the expense of such a campaign. Their phonograph department can afford specialty salesmanship methods because their cost of goods was from 40% to 50% of term payment selling price. Their rugs carried about the same margin, and in neither instance was there the element of "after-service."

(5) Patent Control —

On the lamp, heating devices and vacuum cleaner, our merchandise expert would discover patent control tending to high prices and elimination of competitive buying.

From these viewpoints he would conclude that conditions were not very favorable for profitably marketing large quantities of appliances. His conclusion would be to arrange to care only for the casual demand by counter display, but as the rental



ARNISHING patriotism with words wins
no war

—Victory Loan

value of such display is very great in high-class establishments he probably would place it in an out of the way corner.

The conclusions reached by our merchandise expert would be correct except for the existence of a very important factor, which is an active force in many localities, passive in others, but always potentially strong. For want of a better name this factor may be called:

The Weight of Authority of the Central Station

Present discounts and profit margins on appliances are based on the cost of doing business of the central station sales department, and not upon the cost of doing business of an isolated retailer except for the simplest sort of service, such as wrapping, delivering, collecting and now and then a minor accommodation repair. A central station can buy at dealer's discounts and conduct a sales campaign with demonstrators and door to door men and show a fair profit, but a dealer cannot do so unless, and here is the whole point of the argument,—unless the central station in the town is also doing so.

This important principle will be explained and amplified by studying three hypothetical cases below:

(a) Case of Central Station Conducting a Retail Sales Department

There is ample evidence that the central station can conduct a retail sales department and sell a large volume of goods at an actual merchandising profit without the necessity of cutting prices or conducting unethical practices reacting against the dealers. The actual results of such a condition in a certain Western city covering the sales results of ten months ending December 31, 1918, and involving the sale of about \$425,000 worth of merchandise figures as follows:

Selling Price	100%
Cost of Goods.....	71.14%
Cost of Installations.....	3.49%
Total Sales Expense.....	5.61%
General Expense	7.85%
Fixed Charges	3.75%
Net Profit	8.16%
	100%

This central station figures on an average of slightly more than two turnovers of invested capital yearly in the sales department, so the net profit figures not far from 19% on the investment. The table covers all rent, advertising, collection expense, discounts, apportionment of depreciation, executive salaries, etc., and is the result of very careful accounting practice by one of the largest corporations in the country.

Inspection of this table will show that the cost of goods is about the same per cent of selling price as is paid by the dealers. The selling expense is exceptionally low on account of the weight of authority of the central station. People regard their power company as an oracle on electrical matters and feel that they will be well cared for in their dealings. Everyone paying a bill, filing a complaint, or ordering a service must pass through the display-room, thus creating at no cost a select clientele which can be reinforced by specialty sales methods of various

sorts. The collection expense is very low because the machinery for collections already exists and the extra cost of collecting appliance installments is almost nil. Most important of all, the central station is bound to make a success of appliance selling because the utilization of the devices is wrapped up with its general electricity supply business. The central station has something else at stake besides merchandising profit.

(b) Case of Retail Contractor Dealer in City Where Central Station Does Not Conduct a Retail Sales Department

Mr. Dealer operates in a city where the central station is "out of it," possibly by his own activity, he feeling that the central station should not compete with him. First comes the belief that the power company business thus stopped should come to him. But it does not do so. His store sales are little if any heavier than before. His competitors have not done any better than he. The power company sales seem to have vanished in mid-air. He will then try door-to-door men, often the very same men dropped by the central station, and he finds they sell about half as much for him as they did when working in the name of the central station. This makes the direct selling cost double that of the central station. Newspaper ads are tried. Floor demonstrators are tried. Results are far from what was expected. The central station is appealed to and it donates its newspaper space, but on account of the general nature of the advertisements they cannot excite much direct action to buy, as they dare not specify one make of article or one definite place to purchase it, or give definite reasons for buying now instead of later.

In cases of all except the few that prove the rule, the year ends with disappointments and a dawning conclusion that high pressure selling plans are not for him,—that the only real money is to be made in the contracting end,—that appliances may help out a little on the rent but that is all. He concludes to place no selling effort on appliances other than attractive show windows, clean counters and well-kept stock. There is no driving impulse compelling him to push the appliance business because he can always fall back on the contracting end. The weight of authority of the central station is not utilized in any direct positive way. The appliance business becomes passive.

During the past year, due to shortage of help, there has been an abnormal demand for labor-saving devices, notably the washing machine, and this has stimulated dealers' sales to a degree. However, indications are plain that sales are overwhelmingly greater on these devices in territories where the central station is actively in the field than in localities where it is not. Information gathered in one of the largest cities of California developed the fact that there was not a single door-to-door salesman at work on electrical appliances, except such cursory calls as the proprietor himself would make in the attempt to sell a few washers, etc.

The conditions described in this section refer to those of the bona fide contractor dealer, and not to those dealers possessing a sub-rosa connection with a central station, jobber, or manufacturer, thereby not being subject to the same forces of necessity.

(c) Case of Contractor-Dealer Operating in Towns Where Central Stations Conduct Active Merchandise Selling.

It cannot be denied that deplorable conditions have existed in the past in such towns, and the conditions still exist in many of them, but fortunately these conditions have been corrected in California, at least, due to the effective work of the California Cooperative Campaign. When the central stations gave free lamp renewals, sold appliances at cost, spread the payments over long terms without adding interest, gave away new electric irons for "any old iron and 98 cents," etc., it was no wonder that the dealers rebelled and they cannot be blamed for scotching out the life of such a pernicious system with every means in their power. Assume though, a condition where the live-and-let-live philosophy of the Goodwin Plan is the rule, where the central station sells at full price with a little better for terms, where it concentrates on a few makes of articles instead of trying to monopolize every line in the market, where its sales department is not overzealous and is guided by the ideal of total volume for all branches of the industry rather than for high totals of its own making. Such altruistic policies do exist, and the lot of the contractor-dealer in such a city is a most happy one.

By a surprisingly small amount of effort Mr. Dealer can do a big appliance business. Mrs. Brown is sold the idea of owning a washing machine by the careful sales-work of the power company solicitor. Woman-like she decides to look around a little bit. At her neighborhood dealers she sees a washer in the window of a different make and stops to inquire as to its merit. Mr. Dealer can match the power company price and proposition. He can make her believe his machine is as good or better. He dwells upon the advantages of buying through him,—closeness for service, etc. Mrs. Brown stands a very good chance of being sold on the spot.

Mr. Smith, storekeeper, is approached by the power company solicitor to put in modern window lighting. The fact is developed that the contractor has the same proposition, with what to him is a superior reflector. Mr. Smith can see that it is just as good. Mr. Dealer says, "Buy of me, I and my friends buy of you, etc." The sale is made.

Even door-to-door men now pay the dealer because the weight of authority of the central station has impressed the consumer with the necessity of the device, and the dealer's salesmen grab their share of the business. The dealers lose many sales to the power company and vice versa. The total volume of sales is very large. The dealers' share is big. The crumbs from the power company's table develop more business for the dealer than he can hope to develop by going it alone.

That this is no Utopian dream is proved by the facts obtained concerning conditions applying where the power companies have long adhered to the policies above described. Some dealers can be found in these cities who complain and think the power company is taking bread from their children's mouths, but such complaints come only from those few who lack business sagacity or who lack the imagination to correctly forecast the conditions that would exist if they had their own way and could put the central stations out of the business. Most dealers and all jobbers are very friendly with the central station. Describing the conditions existing in one of the cities of this classification Mr. J. F. Derge, Superintendent of Sales of the Utah Power & Light Company, Salt Lake City, reports on this phase of the matter, in part, as follows:

"Our policy, as evolved during six years' development, is practically that of the Goodwin plan as applied in the East. We have established our merchandising along certain definite lines consistent with good business policy. We sell strictly at retail. However, we reserve the right to put on an occasional feature sale whereby we make some concession which might prove attractive to the buying public. This need not necessarily be a cut in price except on articles that have been slow moving or are obsolete so far as up-to-date devices are concerned, but good for whatever purpose the customer may wish to use them for. Particular attention is being paid not to encroach on the other fellow's field. Any business of a jobbing nature is always referred to the local jobbers. Our retail sales, for the most part, are at manufacturers' lists and we adhere strictly to them.

"So far as we know the sentiment of the dealers throughout our territory is good. In fact, Mr. Alexander, formerly with the Society for Electrical Development informed me that he knew of no section in the country where the relations between the dealers, central stations and jobbers was any better than here.

"It may interest you to know that our activities along these lines have meant increased sales for all the dealers. We know this to be a fact by admissions made to us by them. Practically all the jobbers are willing to line up with us for some leader or other which they might handle for the reason that they are assured an increased volume in sales because of our activity in these lines, not because of our own sales, but because of the interest that is created amongst their customers. The fact that the power company accepts an appliance as a selling proposition encourages other dealers to do the same.

"In connection with the regular line of merchandising, it may be well to mention our appliance repair policy which was instituted a few years ago. This has been carried out principally in Salt Lake City and Ogden. We find that we are actually repairing more appliances through our Fix-it Department than the number of new appliances sold throughout the year. This is indeed an important item from the current selling point of view when you consider that the merchandising was primarily entered into for that purpose. In Salt Lake City division alone the number of repairs made through our Fix-it Department amounted to 10,879 during 1918. A sufficient amount is charged to provide for all overhead. The psychological time for the customer to want his appliance repaired is when he comes to our store to pay his electric bill. It is at that time he thinks of the defective appliance and naturally brings the appliance along with him. This follows the line of least resistance. If it were necessary for him to go out of his way to have the appliance repaired, the chances are that the appliance would not even be thought of and left lying on the shelf."

"Since writing you we have had further occasion to realize that our policies are right. A Washer Campaign was instituted the first of March and during the first two weeks of the campaign, we sold 366 machines. With a casual meet-



OUCH for your patriotism

—Victory Loan

ing with contractor-dealers and jobbers we always take occasion to make inquiry as to their sales on this item. In every instance we have verified to us that their business has been stimulated to a very marked degree because of our campaign methods. Some of these dealers have offered the information voluntarily. This stimulation is also indicated by the large number of inquiries coming from points outside of our territory. Nor is this confined to ourselves. We learn that practically all dealers are receiving these inquiries as well as we."

Through the courtesy of Mr. W. R. Putman, Manager of the Commercial Department of the Utah Power & Light Co., we are permitted to present the following table, which is of interest from many standpoints. It portrays the very large use of electrical appliances in the territory, which figures are surprising when one considers the territory covers only 50,888 residence consumers. It shows the totals for the calendar year of 1918 as to number of articles sold by the power company, and a close estimate of dealers' sales during the same period. This sales report should give all parties food for considerable thought:

TABLE SHOWING SALES IN TERRITORY OF UTAH POWER & LIGHT CO.—CALENDAR YEAR 1918—50888 RESIDENCE CONNECTIONS

	Sold by Central Station.	Sold by Dealers— Estimated.	Sold by both Dealers and Central Station.	Number of articles in use on Lines. Total.
Lamps	156,000	226,000	382,000	
Ranges	679	few	679	2,376
Grills and Discs.....	1,462	950	2,412	11,536
Water Heaters	224	few	224	750
Percolators	405	300	705	1,660
Fans	309	900	1,209	3,500
Irons	3,741	2,500	6,241	56,934
Washing Machines ..	1,703	1,700	3,403	11,265
Cleaners	956	1,000	1,956	4,469
Other Appliances	2,497	2,000	4,497	8,500
¹ Signs	31	10	41	1,122

There are many other evidences of the importance of the central station engaging actively in merchandising in order to insure the prosperity of the dealer. The writer's business relates largely to the electric sign field which articles require specialty salesmanship. A few years ago in Oakland we operated an electric sign campaign with the direct co-operation of the central station. Our competitor in the city thought ruin was staring him in the face. Instead of that he became so busy that his factory had to expand into the adjacent lot, so great was the amount of business developed by the central station that he was successful in obtaining. Since the time of that campaign the Oakland electric sign business has languished for us and for our competitors as well in spite of unprecedented prosperity of the city.

To apply the shoe to the other foot, at Stockton the central station operated a sign campaign recently, buying signs from our competitor. Yet we were able to place more dollars worth of signs in Stockton than in an adjacent city during the year in question, even though we maintained a man at the nearby city more or less permanently, and only visited Stockton occasionally. We would prefer to

have the central station actively campaign another make of electric sign and seemingly work against us than to remain passive and do nothing.

The Goodwin plan, in which we are all believers, states in Plank 7 to the effect that central stations shall maintain retail sales departments in order to provide additional points of contact between the consumer and the electrical industry. This is a different idea than many of us have had as to the Goodwin plan, but the desirability for the incorporation of that plank must have been due to the overwhelming mass of evidence of the nature described herein.

The platform of the California Co-operative Campaign embodies the principle that central stations shall not be asked to discontinue the sale of appliances. However, there is a tendency to make such requests by implication, if not directly. Instead of there being any such feeling as this, it is believed by many that there should be a definite movement in the opposite direction so that the central stations will remain in the field very actively. The supervisory powers of the California Co-operative Campaign should then be directed, in addition to its present objects, to the task of keeping sales practices of the central stations in proper ethical channels. Only in this way can the industry receive the benefit of that powerful influence—the weight of authority of the central station.

The activities of the California Co-operative Campaign have been remarkably conducive to the welfare of the industry. Let the good work continue. Let it add to its functions the duty of controlling in an advisory capacity the sales policies of the central stations as well as the dealers. The powerful influence of the campaign leaders should be brought to the support of a policy that will prevent central stations from cutting prices, giving free lamp renewals, selling on term payments without interest, installing articles (such as ranges or signs) at nominal expense without offering the same privilege to goods of the same nature sold by dealers, and last but not least, acting to limit the manufactured lines that a central station can sell in order that the dealers may have their own exclusive lines and talking points.

CORRESPONDENCE COURSE FOR ELECTRICAL WORKERS

The following announcement, of interest to Journal of Electricity readers, was made in a recent bulletin published by the University of California:

Subject: Correspondence Course for Electrical Workers

To meet the needs of electrical men throughout the state, a correspondence course taking up the various phases of electrical study has been prepared by the State University Extension Division, with the endorsement of the California Cooperative Electrical Campaign, a state-wide organization made up of electrical dealers, manufacturers and of those concerned with central power stations.

The course aims at giving fundamental instruction in electricity to stations operators, office employees, salesmen, contractors, dealers, jobbers, telephone and telegraph men, manufacturers' employees, repairmen—in fact to everyone connected with the electrical industry. A series of 16 articles, constituting the text book for the course, is to be published, beginning at once in successive numbers of the Journal of Electricity. Several pages of mimeographed instruction material sent out by the Extension Division to those enrolled in the course will supplement the articles. Enrollments are being received at the University Extension office, California Hall, Berkeley.

¹ Lightless nights and steel restrictions in 1918 affected this item adversely.

The Business Library

BY LOUISE B. KRAUSE

(When you need information, where do you turn? Do you call upon acquaintances on a chance—or do you make use of the resources and trained service of the public library of your community? The function of the business library is to supplement that of the public organization and to provide a clearing house of live information within a company where even confidential problems can be effectively met. This is the second of a series of articles by the librarian of H. M. Byllesby & Company of Chicago which aim to show not only how the large company may best meet its problems of records, but how the smaller ones may properly file and catalog needed material. Attention is called to the necessity for written permission in reprinting these articles.—The Editor.)

COORDINATION OF THE BUSINESS LIBRARY WITH PUBLIC LIBRARIES



The Business Branch of the Newark Library with a show window used for displaying its resources.

FTER the resources for information which exist within the business organization have been adequately centralized as briefly described in the previous issue of the Journal of Electricity, the next important step is to coordinate these resources with all other existing library facilities of the city in which the business firm is located. There should be a thorough survey of these libraries in order to ascertain as far as possible the content and availability of their resources. This is an important factor in the creation of a business library, when one considers the problem of shelving much material, within the more or less limited space occupied by a business organization. Floor space in skyscrapers is too valuable to be used as a mere storehouse for printed ma-

terial used only on rare occasions, and there is also the added expense of a staff of workers to care for a large collection. The business library must, therefore, be considered solely as a working laboratory, and care taken not to include in it material which will be seldom used, particularly in cities where busi-



THE LIBRARY IN USE

One of the busy days in the John Crerar Library of Chicago. This is the middle of the afternoon—but the reading room is in active use by business men.

ness organizations congregate, and where are located large public libraries having excellent resources which can be used to supplement the "working laboratory" collection of the business organization.

This principle will not apply, however, to those business libraries which are maintained at the headquarters of national associations. Such libraries must collect everything on their subjects, and be prepared to be a central bureau of information on their specialties, for their membership throughout the United States. For example, the libraries of the National Safety Council and the Portland Cement Association, located in Chicago.

This policy of coordination was expressed in the following words, by a large corporation several years ago when it organized its library: "We will keep our library down as far as possible to a small working collection, and our librarian shall be a go-



BUSINESS MEN IN THE NEW YORK LIBRARY

This is a small room in the Economics Division of the New York Public Library accommodating about twenty-five readers to which business men and investigators are permitted to bring their own typewriters, dictating machines and stenographers. Books and other material are reserved for indefinite periods for those to whom a seat is assigned.



VISIT a war hospital — then do your part

—Victory Loan

between us and the other libraries of the city when we want information not available in our own collection." Thus the busy man of affairs is able to keep in touch, through his librarian, as proxy, with many avenues of helpfulness, which would be closed to him were it not for the fact that he had been far-sighted enough to employ a librarian to act for him in these matters of detail.

Public library facilities, while they supplement can never be a substitute for a library within a business organization, for different groups of business people who are vitally interested in one particular subject, or more often in only one phase of a sub-

and without the limitations which would be imposed if it were the property of some one else, and required particular care to keep it intact, for the business man often wishes to clip or give away the printed information in his possession.

The business library is, however, not antagonistic to the public library at any point. On the contrary, the business library must coordinate its resources with those of the public library and work in harmony with it.

The large business organization which can afford to employ a librarian, and the small business firm which cannot, will find a wealth of helpful material in the public libraries of their vicinity and this material will be noted in detail in future articles in this series.

Many of the smaller public libraries which are not large enough to maintain special business departments are giving most excellent service to business men. A number of the large public libraries of the country are making a specialty of serving business needs through departments organized particularly to serve business men. Some of these are the Division of Economics and Documents of the New York Public Library, the Business Men's Branch of the Free Public Library of Newark, New Jersey, and the Industrial Department of the Los Angeles Public Library. The John Crerar Library of Chicago is a free reference library covering sociology and natural and applied science, which cannot be excelled by any other library collection in the United States in the facilities which it offers to business men. Every business organization should get acquainted with the public library of its city and ascertain what that library is able to do for it.

The Cost and Value of the Business Library

The cost of maintaining a business library is in no sense comparable with its value; for the help which a business library may give in a single instance is often of sufficient value to offset its cost of maintenance for a whole year. For example, a business firm had a law suit in a distant city and sent one of its employes to give expert testimony in the case. This employe found as the hearings in the case progressed, that he could strengthen his testimony if he had at hand figures showing the market price of lead for the past ten years. There was no time to spare in obtaining these data. He sent a telegram to the home office, which was received at 11:30 A. M. saying that he would call them by long distance telephone at noon and to have the figures ready. The head of the department to whom the message was addressed, with some perturbation, appealed at once to the librarian of the company, who was able in ten minutes to produce a table giving a summary of the prices desired, which had been printed in a technical journal. The company won the law suit and in comparison with the large amount of money saved, the salary of the trained librarian who knew how to meet the emergency, was a very small item.

No two business libraries are comparable as to cost of maintenance. Each must allow for financing



A BUSINESS LOCATION IN THE BUSINESS DISTRICT

This is just one corner of the Business Branch of the Free Public Library of Newark, N. J., showing their collection of directories

ject, will naturally collect and know more about that subject than a general library serving a thousand and one interests can be expected to do.

The business librarian who is given the confidence of the officers of his organization, gets saturated with a knowledge of the business of the organization and is able to sense in advance what information will be needed, and will be prepared as far as possible for the emergency when it comes.

All librarians of public libraries will undoubtedly agree to the statement that they are not in a position to act as confidential library adviser to rival business corporations. The Public Library must deal impartially with all inquiries and cannot give precedent to any inquirer simply because he is in a hurry. Every man must wait his turn because the needs of other inquirers are equally important with his.

If the Utopian state should ever arrive when our public libraries have all the money necessary to meet the every information need of the community, the argument that the public library should serve the interests of business men, who are tax payers, in such a manner that it would not be necessary for them to have libraries within their business organizations, can be answered by a parallel suggesting that the public library should serve all the interests of the public that no one need have a library in his own home. A business organization desires to make its own selection of material, on the basis of its needs and tastes; it wishes to have this material close at hand without any borrowing restrictions, so that it can be used quickly, without loss of time,

on the basis of its individual needs and the money it can afford to spend.

If a business firm owns the building which it occupies it does not have to consider the rental of floor space for the library. If it has a liberal policy of advertising in the best technical or trade journals, it will need to spend very little on periodical subscriptions, as it will receive copies free on account of advertising. If it is a liberal user of the publications of the United States Government, it will find they cost little or nothing, and in any case the amount spent by business libraries for information special to a particular industry, is never very large, because often the most valuable data cost practically nothing to secure. Mechanical equipment, which will be discussed in detail later in this series of articles, is largely the initial expense, and the amount of money to be spent each year for additions to the original equipment, will be quite small. The principal annual expenses in maintaining a business library are the salaries of the librarian, and assistants if required, and the additional expense of stenographic and office boy service.

The great mistake made by some business firms in maintaining library service has been the employ-

ment of inadequately trained librarians who do not produce high grade results. The writer saw, some time ago, the sorry spectacle of one of the largest corporations in the country trying to inaugurate library service under the direction of a fourteen-dollar-a-week file clerk who had not a single educational requirement necessary for the success of the undertaking. Such firms generally proclaim business library work a failure instead of admitting they have made a wrong start and that they should have employed a high grade trained librarian. What the essential qualifications for successful business librarianship are, will be stated in a special article in this series.

In conclusion, it should be said, that in establishing library service, a business organization must be willing to give such service a reasonable length of time to grow into the work of the organization. A wisely selected collection of material, adapted to the needs of the business, and thoroughly organized, to give quick and accurate results, should be tested just as a piece of machinery is tested, namely, set up the apparatus, put it in full operation under competent supervision, and in the case of the business library the verdict cannot but be—"it works."

PRACTICAL LESSONS IN ELECTRICITY

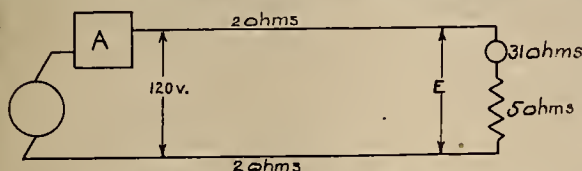
BY H. H. BLISS

(A practical course in electricity is advocated elsewhere in this issue as a necessary part of an electrical salesman's training. Here is just such a practical course provided by the Extension Division of the Universities of California and Oregon, for which the Journal of Electricity is used as a text. The author is in charge of the technical extension instruction for the University of California. This is the second article—but for those starting the course late, all previous articles will be furnished.—The Editor.)

SERIES AND MULTIPLE CIRCUITS

Series Circuits.—Many electric circuits consist of several different parts through which the current passes in "series." This means that the electricity must go through one part after another. Make a clear distinction between this arrangement and the "multiple" circuit in which the current divides and flows through several branches. Fig. 1 illustrates the first and Fig. 2 the second type.

What is said about these applies to direct current circuits and also to those alternating current



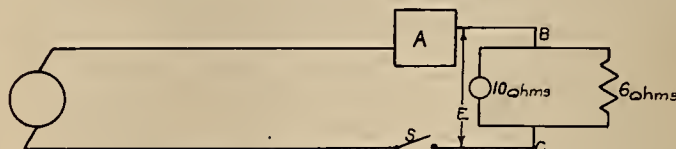
RESISTANCE IN SERIES—Fig. 1.

In spite of the varying resistance of the various elements of the circuit, the current passing through each is the same—3 amperes.

circuits which contain only simple resistance and no electromagnetic apparatus or condensers.

The current leaving the generator in Fig. 1 goes first through an ammeter, then through the upper wire, then through a lamp, then through a resistance coil, and finally back to the generator through the

lower wire. It is obvious that if 3 coulombs per second (3 amperes) pass through the generator to the ammeter, the same number must travel along the upper wire through the lamp and the coil and back to the generator through the lower wire. If any more coulombs passed out through the ammeter



RESISTANCE IN MULTIPLE—Fig. 2.

The current divides between the lamp and the resistance coil, 3 amperes being carried by the one, 5 by the other.

than came back through the lower wire there would be an accumulation of electricity somewhere in the right hand part of the circuit; if any more returned to the generator than left it there would be a production of coulombs somewhere in the right hand part of the circuit. Both of these alternatives are



VALUE your honor — pay your bills

—Victory Loan



In this park in Portland, Oregon, 50 lamps of 400 candle power each are connected in series. The lamp at the left of the center takes 6.6 amperes; how much is taken by the lamp farther along the walk? The voltage across each lamp averages 37 volts; what is the drop in the line wires if the current leaves the substation at 1880 volts? What is the resistance of the line and of each lamp?

impossible with this apparatus and hence we conclude that:

In a series circuit the total ohms = the sum of same everywhere.

If a resistance of 2 ohms is in a series of another of 3 ohms, the electromotive force must overcome 5 ohms in sending current around the circuit. If we apply 20 volts the amperes will amount to $20 \div 5$ or 4.

In a series circuit the total Ohms = the sum of separate resistances.

To find the voltage across each one of the resistances in the previous example we apply Ohm's Law as usual: $4 \times 2 = 8$ volts across one, and $4 \times 3 = 12$ volts across the other. Across the whole combination the pressure = 4 amps. \times 5 ohms = 20. This result is also found by adding the two voltages 8 and 12.

Pressure across a series of resistances equals sum of the voltages across the separate resistances.

In Fig. 1 a lamp of 31 ohms resistance is in series with a coil having 5 ohms. Current is supplied from a 120 volt generator through two line wires of 2 ohms each. What current flows and what pressure is used to force this current through the lamp? The total resistance is 40 ohms. Hence the current = 3 amperes. To drive 3 amperes through 31 ohms requires 3×31 or 93 volts, which is the pressure across the lamp.

Voltage Drop.—In this example we find the pressure across the lamp considerably lower than that supplied by the generator. There has been a drop in the voltage from 120 to 93, or 27 volts. This may also be calculated by Ohm's Law. The resistance of the circuit between the generator and the lamp totals 9 ohms. The pressure necessary to force the 3 amperes through this is, of course, 3×9 or 27 volts.

The voltage drop in any conductor equals the pressure required to force the current through its resistance.

The drop between a generator and its load de-

pends, then, upon both the line resistance and the number of amperes.

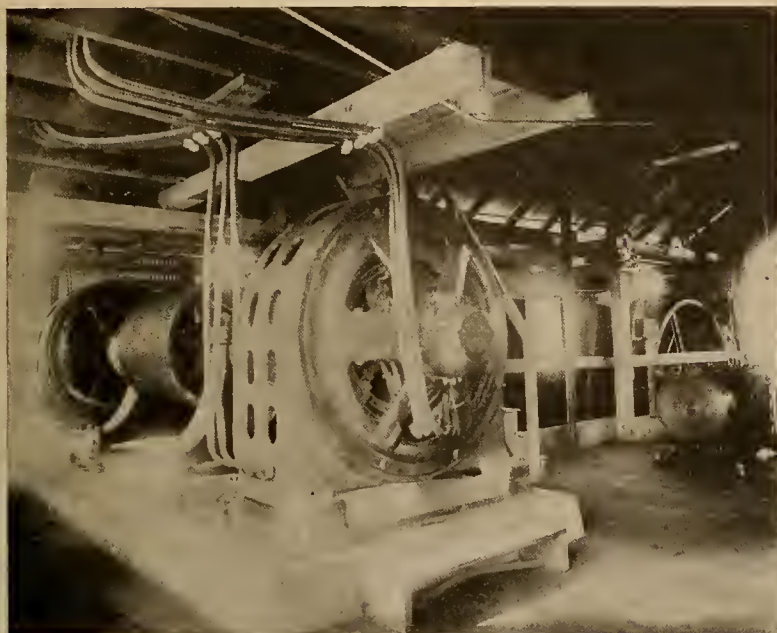
Resistances in Multiple.—When several lamps are located in one lighting fixture they are generally not connected in series with each other. Though they are all governed by one wall switch, any lamp can be burned out or unscrewed without affecting the others. In a series circuit this could not be done.

In Fig. 2 we have a simple example of two resistances, a lamp and a coil, connected in "multiple" with each other; that is, connected so that the current flowing through the ammeter divides and part goes through the lamp and part through the coil. Either can be disconnected without stopping the



This municipal Christmas tree in a California city was lighted by 70 lamps in parallel. Each lamp took .23 ampere and the circuit voltage was 110 at the tree. The current was brought from a transformer on two wires of .12 ohm each. Can you calculate the resistance of each lamp, the combined resistance of all of them, the voltage drop in the wires and the voltage at the transformer?

current in the other. This arrangement is sometimes spoken of as a "shunt" connection or a "parallel" connection.



Two 400 horse power motors are connected in multiple on the same power circuit. They are furthermore "direct connected" to the same shaft, so that the load is divided equally between them and the motors take equal currents. They lift the mine hoist at the South Eureka gold mine on the Mother Lode in California.

Suppose that there is a pressure of 30 volts between the line wires at point E, close to the load. This is a measure of the effort to send current through the lamp and, if the lamp has 10 ohms resistance, it will carry a current of 3 amperes. The same pressure tends to send current through the coil, and, if that has 6 ohms, it will carry 5 amperes. The ammeter will read the sum of these two currents, 8 amperes.

either one alone, we realize that the combination offers less resistance to current flow than either of its parts. Considering the lamp and coil as united into a piece of apparatus with terminals at B and C, we may compute its resistance from Ohm's Law as volts \div amperes : $30 \div 8 = 3.75$ ohms.

A standard way to calculate is to assume one volt applied to the circuit, add the currents which would flow, and divide their sum into the one volt. Trying this on Fig. 2 we have $1/10 + 1/6 = 16/60$, the combined current. The resistance $= 1 \div 16/60 = 60/16 = 3.75$ ohms.

In a multiple circuit combined resistance is less than ohms in any one one branch; combined resistance $= 1 \div$ sum of reciprocals of branch resistances.



These two fans operate in multiple on the same circuit. Hence either can be turned off without stopping the other. If the line current is 5 amperes at 110 volts when both are operating, what is the voltage and amperage for each motor? What is the resistance of a heater which takes as much current as three fan motors?

In a multiple circuit the voltage is the same across every branch; total current equals the sum of the branch currents.

Combined Resistance.—As the combination of resistances shown in Fig. 2 takes more current than

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule XII. A fair price will be charged for drafting or engineering services when the contractor is called upon to render such services.



OLLEYS of bonds to back the boys

—Victory Loan

SPARKS—Current Facts, Figures and Fancy

(Two hundred dollars for a pair of shoes makes us feel a little better pleased with our own war prices. The telephone in the war zone, felt from spun glass, watering weeds, building railroads of mercury and various other items of special interest, in war and peace, are further included in this brief survey of odds and ends in electrical news.—The Editor.)

Here are some prices in Russia: Six months ago sugar was \$12.00 a pound, a suit of clothes \$800.00, a pair of shoes \$200.00, a loaf of bread \$6; and, if you had not money enough to buy in these wholesale amounts and chose to buy sugar by the lump, each lump cost 50 cents.

* * *

Felt made from spun glass is said to be used for insulators in storage batteries in Italy. Cloth is also produced from this substance, which is manufactured after a process invented by Signor Luigi Bisigato of Venice. A new society, the "Vitrum," has been formed, with extensive plants at Naples, for its manufacture.

* * *

The number of telephones in use in the United States at the close of the calendar year 1917 was 11,713,228—one to every nine persons, or every two families; and the number of calls made during the year is estimated at 21,842,000,000, an average of more than two hundred for every man, woman, and child in the country.

* * *

It is stated that 5,000 miles of telephone wire were laid in the St. Mihiel salient and along its borders by the Americans before their attack on the salient. When the battle opened trucks laden with wires started north, unreeling the wires through No-Man's-Land, and 6,000 telephone instruments were used to connect these wires in the battle zone.

* * *

Verily there is a use for everything. Noting that no vegetation grows around Owens Lake, California, because of the chemicals contained in the water, the Southern California Railroad has hit upon the scheme of filling oil cars with the lake water and sprinkling it along the right-of-way on the San Joaquin Division, thereby effectually and inexpensively killing the weeds which are the bugbear of the maintenance expert.

* * *

There is a very serious rice shortage in South China and the Far East generally, and so far as the South China field is concerned, nothing short of a rice famine is in sight. The situation is further complicated by the fact that owing to the high price and short supplies of wheat flour and other bread-stuffs, there is nothing to take the place of the rice in food for the native population. The situation in Japan is such that already riceless days have been instituted.

* * *

Forty per cent of the total known oil supply in the United States, exclusive of oil shale deposits in

three states, has been exhausted, according to Secretary Lane. Up to last January 1 a total of 4,598,000,000 barrels had been produced, while the known available oil resources, not counting the shale deposits, in the ground and in field storage were estimated at 6,740,000,000 barrels. Distillation of shale deposits in Colorado, Utah, Wyoming, however, might produce 70,000,000,000 additional barrels of oil.

* * *

A lack of knowledge of geology was responsible for an engineer in South Africa building the road bed of a railway out of cinnabar. This is the chief ore of mercury and exceedingly valuable. The cinnabar remained there with the trains running over it until found by accident by a mining expert, who, looking out the carriage window, noted the brilliant color with something unusual about it and went back to examine it.

* * *

Here is a description of life in a Russian school under the Bolshevik regime: "Pupils do exactly as they please, even walking in and out in the middle of a lesson. No punishments are inflicted, no home work is set, and no marks are allowed. Each class has its own committee, and generally the most popular boy represents the others at the masters' meetings. Should a master not be popular the remedy is simple, for the pupils turn him out."

* * *

The Los Angeles Aqueduct was recently used effectively as a highway by a motorcycle with a side car which found the usual road blocked by a landslide. The Boquet Canyon Siphon provided the road bed and the occupants were a gentleman from Los Angeles and his wife. Stops and starts were made by driving the motorcycle wheels down the slope of the steel until the side car was well off the top of the pipe and then lowering the side car wheel until the tire rested on the steel surface. The ride was successfully accomplished.

* * *

A pilotless aeroplane which can be set to land within a short distance of a designated spot some hundred miles off is reported to have been one of the war's inventions which the armistice nipped in the bud. Secretary Baker in a recent address told of an airplane which went out under control of a pilot without making a landing, returning to its point of origin after locating the distant objective for the test. Another aeroplane was then sent out under automatic control to land at the designated point, and it effected the landing so close to that point that had it been a shell it would have been considered a good shot.

PERSONALS

A. D. Page of the Edison Lamp Works will attend the Coronado convention.

A. H. Jackson of the law department of the General Electric Company is a recent San Francisco visitor.

Gerard Swope, recently appointed president of the International General Electric Company, is on his way to the Orient.

Stephen T. Mather, director of national parks for the United States, spent several days in San Francisco recently en route to Hawaii.

Capt. Arthur F. Bridge, formerly of the engineering staff of the California Railroad Commission, has returned to San Francisco from France.

W. R. Herstein, secretary and treasurer of the Electric Supply Company, Memphis, Tenn., and Mrs. Herstein were recent visitors in California.

H. C. Ross has transferred from the commercial department of the Pacific Gas & Electric Company at San Francisco to the Fresno district.

Charles Matthews, who installed the electric range equipment at Camp Curry, Yosemite Valley, has taken charge of electrical operations at Camp Curry.

R. C. W. Libbey, representative of the Simplex Electric Heating Company, is visiting the Pacific Coast preparatory to establishing new offices in the West.

J. R. Baker, auditor for the Incandescent Lamp Committee of the General Electric Company, New York, is visiting Seattle and other Northwest centers.

Armiger F. Dredge, son of Theo F. Dredge of San Francisco, has been promoted to master engineer with the 33rd U. S. Engineers with the A. E. F. in France.

L. R. Cady, general manager of the Lassen Electric Company of Susanville, an enterprising city of Northern California, is a recent San Francisco visitor.

W. G. Ely, Jr., superintendent of construction of the General Electric Company at Schenectady, is to be a California visitor. His family will accompany him.

T. E. Bibbins and D. E. Harris, president and vice-president of the Pacific States Electric Company, were in Seattle recently while making a tour of the Northwest.

Lieut. E. B. Strong, Jr., who was formerly a member of the Journal of Electricity staff, has returned to the Pacific Coast after being in France but is not yet out of the service.

George N. Rooker, manager of the Richmond, California, division of the Western States Gas & Electric Company, has been elected a director of the local chamber of commerce.

Geo. A. Hughes, president of the Edison Electric Appliance Company, Inc., together with Mrs. Hughes will visit the Pacific Coast in April and attend the Coronado convention.

S. M. Murray of the Illinois Electric Company has returned to Los Angeles after attending the meeting of the Electrical Credit Association of the Pacific Coast at San Francisco.

C. G. A. Baker, general manager of Baker-Joslyn Company, with headquarters in San Francisco, has returned to his home office after an extended visit to his branch houses in the Northwest.

L. Gibson, manager of production of the Schenectady works of the General Electric Company, is visiting the Pacific Coast. Mr. Gibson is a brother of Charles Dana Gibson, the well known artist.

Frederic P. Vose, secretary of the National Electrical Credit Association, was in San Francisco recently in attend-

ance at the annual meeting of the Electrical Credit Association of the Pacific Coast.

S. L. Whitestone, general auditor of the General Electric Company with headquarters in Schenectady, and Mrs. Whitestone passed through San Francisco en route to the Orient for an extended vacation.

Samuel T. Wellman, president of the Wellman-Seaver-Morgan Company of Cleveland, Ohio, is a recent San Francisco visitor. Mr. Wellman is a past president of the American Society of Mechanical Engineers.

E. W. Rockafellow, manager of the supply department of the Western Electric Company with headquarters in New York City, is expected to attend the Coronado conventions the latter part of April and first of May.

A. L. Menzin, who was formerly located on the Pacific Coast and who has been practicing industrial engineering during the past five years with office in Philadelphia, has opened an office in the Monadnock Building, San Francisco.

T. V. Halsey was recently elected vice-president and director of the Philippine Telephone & Telegraph Company to fill the place of F. W. Eaton, who died during the year. The company's annual statement has not yet been received from the islands.

A. J. Turner, a well known construction engineer in the Pacific Northwest, has been named engineer of the Columbia basin commission to be in full charge of the engineering features of the preliminary survey which the commission is about to launch.

Dr. J. A. L. Waddell, now of Kansas City, Mo., one of the builders of Portland's lift bridges, has been elected a member of the French Academy of Science, the highest honor an engineer can achieve. Dr. Waddell is one of only 10 Americans who have ever won such honor.

W. L. Goodwin, of the General Electric Company, plans to attend the convention of Westinghouse Agent Jobbers at Del Monte where he is to be a speaker on the program. He will also attend the Coronado conventions and bring again his message of cooperation to the electrical industry of the West.

George Mackenzie Brill, consulting engineer for the U. S. Shipping Board, is a recent Portland, San Francisco and Los Angeles visitor. Mr. Brill's task is to appraise the ships in American ports taken over from Germany during the war. He is a past vice-president of the American Society of Mechanical Engineers.

E. A. Batwell is to continue with the Puget Sound Traction Light & Power Company, at Seattle, notwithstanding the sale of the street car system of the company to the city. He retains his title of publicity agent and will also continue as editor of the Puget Sound Electric Journal which is the house organ of the district.

Dr. B. Okazaki, civil engineer of the department of Home Affairs, Imperial Japanese Government, and formerly chief engineer of the Ishikari River Improvement Works, is a recent Pacific Coast visitor. Dr. Okazaki has visited in California all of the big dams now under way including the Calaveras, and the Otay near San Diego.

Paul H. Manchester, formerly with the Pacific Gas & Electric Company, has arrived in San Francisco with the Engineers returning from France. Mr. Manchester saw service with the heavy artillery and has many interesting experiences to relate, including the experience in which he lost the hearing of an ear due to the roar of the heavy artillery.

S. B. Anderson, treasurer of the Pacific States Electric Company, called a conference of the company's several assist-



VARIOUS excuses pay no bills

—Victory Loan

ant treasurers at San Francisco prior to the meeting of the Electrical Credit Association of the Pacific Coast. Attending this meeting were Roy Worth of Seattle, H. R. Olsen of Portland, H. C. Chapman of Los Angeles and C. W. Goodwin Jr. of San Francisco.

C. E. Grunsky, consulting engineer, with headquarters at San Francisco, has left for a business trip to New York, Chicago and Washington. On his way home the latter part of the month he hopes to attend the gathering of engineers to be held in Chicago in the interest of forming a national department of engineering, in which he has taken an active part for some time past.

Harry C. Kendall, formerly traffic engineer for the Portland Railway, Light & Power Company, has returned to Portland to become associated with the Lumbermen's Trust Company. Mr. Kendall has for the past year been connected with the Emergency Fleet Corporation in the negotiations with public utility companies for improved facilities and with the Delaware river district as engineer.

James B. Black, salesmanager of the Great Western Power Company, Gaskell S. Jacobs, of the engineering staff of the California Railroad Commission, and R. M. Alvorð, local supply manager of the General Electric Company, accidentally ran across each other lately at one of the well known hospitals in Oakland to find each was to be congratulated upon being the proud possessor of the title of "father."

George W. Goethals, builder of the Panama Canal, to whom an issue of the Journal of Electricity was dedicated some time ago, has recently been awarded the John Fritz Medal by the National Societies of Civil, Mining, Mechanical and Electrical Engineers. The medal has previously been

awarded to Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas A. Edison, Charles T. Porter, Alfred Noble, Sir William Henry White, Robert W. Hunt, John Edson Sweet, James Douglas, Elihu Thomson, Henry M. Howe and J. Waldo Smith.

Robert Sibley, editor of the Journal of Electricity, has been asked by the Extension Division of the University of California to deliver the lecture before the Foreign Trade Club of San Francisco, April 23, 1919, on the subject: "Foreign Trade from the Engineer's Viewpoint." Mr. Sibley will combine his knowledge of western engineering progress with the results of a personal survey made by him in the Orient on matters pertaining to engineering development. He will conclude by showing that certain principles that are being enunciated by the California Electrical Cooperative Campaign present the best means of bringing about effective and remunerative international commercial and engineering relations with our foreign neighbors. The Foreign Trade Club of San Francisco is composed of five hundred men and as a consequence admission to the lecture will have to be limited to members only, except by special invitation.

OBITUARY

Robert E. Twohy, vice-president of Twohy Brothers of Portland, active head of the large railway construction firm and associated in all of the extensive Twohy interests, died at San Francisco recently. Although but 28 years of age Mr. Twohy was president of the California & Oregon Coast Railroad, which operates from Grants Pass to Crescent City, and was looked upon as one who would have achieved national prominence.

California Electrical Cooperative Campaign

(The California Electrical Cooperative Campaign has won the approval of merchants in every section of the state for the practical nature of its assistance. It is now broadening its work by adding a new field agent in the southern district. Below is given an expression of approval from one who has worked alongside the campaign representatives—and a sample of some of the work of the campaign.—The Editor.)



A. L. Spring, the first Field Representative employed by the Committee in January, 1918, was for many years in the employ of the Western Electric Company, part of the time being assistant manager of their Los Angeles office branch. He covers that part of California that lies south of the Tehachapi, his territory on the coast extending to just north of Santa Barbara. The Advisory Committee in charge of the Campaign has arranged for the four Field Representatives to attend the conventions which will be held at Coronado, week ending May 3rd, in order that the electrical men in California may become better acquainted with these Field Representatives, and in order that the Field Representatives may be able to carry back to their respective territories, for the benefit of those unable to attend, some of the good ideas developed in the discussion at the convention.



W. F. Brainerd, the second Field Representative employed by the Committee, was for several years a successful commercial representative of the Hotpoint Heating Company. He entered the employ of the Campaign Committee in March, 1918, and now covers all that portion of California north of Tehachapi, which is covered by Campaign activities, except that in the vicinity of San Francisco bay, which is covered by C. C. Davis. It has not yet been considered advisable to extend the travels of the Field Representatives into the sparsely settled districts of the state, where traveling expenses are high.



C. C. Davis, the third Field Representative employed by the Committee, commenced Campaign work in February, 1919, covering the following territory: Contra Costa county, Alameda county, Marin county, San Francisco county, San Mateo county, and Santa Clara county south to and including San Jose. Mr. Davis was for several years the Wiring Device Specialist of the General Electric Company at San Francisco, and more recently was manager of the Electrical Department of the Baker-Hamilton-Pacific Company, one of the leading wholesale hardware concerns in San Francisco.



Lieut. S. A. Sharpe commenced work as Field Representative for the Campaign in the middle of March, 1919. Lieut. Sharpe, who is a technical engineer, U. S. Air Service, has just returned from service overseas. Prior to his enlistment in the army service, Lieut. Sharpe received considerable technical training and practical experience in the electrical field through his employment by various concerns in New England and the Southwest. He comes to his new work well equipped to carry it on successfully. He will act as assistant to Mr. Spring in the southern section, paying particular attention to the electrical contractors and to electrical contracting problems. This move comes appropriately at a time when home building and home wiring campaigns are being carried out as a national feature.

FIELD AGENTS OF THE CALIFORNIA
ELECTRICAL COOPERATIVE CAMPAIGN

MAKING BETTER MERCHANTS

A Comment on the California Electrical Cooperative Campaign

Through the efforts of the local Field Representatives A. L. Spring and his assistant, F. A. Sharpe, the electrical contractor-dealers have been brought together under on organization with a slogan, "Better Merchandising."

Today when you walk into any live electrical contractor-dealer's store you find a real merchandising institution.

A good example of the help and cooperation given by the Field Representatives was brought out by Mr. Farley of the Reed-Farley Electric Company of Fullerton and Anaheim. Mr. Farley is very enthusiastic over the assistance given him when planning his new store in Anaheim, and made the following remark on opening day:

"We really feel we owe the California Electrical Cooperative Campaign a great deal for their splendid assistance in planning our new store. The suggestions given us for our store arrangement and window trim have proven a great help and we feel confident these ideas will be a big help in building up our business."

The contractor-dealers in Southern California are very enthusiastic over the help given them by the Field Representatives and all admit the California Electrical Cooperative Campaign has been a big factor in building up their business by helping them use better merchandising methods.

CARL HEINTZ,

Promotion Dept., Westinghouse Electric & Manufacturing Co., Los Angeles.

THE DEALER AND THE ELECTRIC RANGE

BY A. L. SPRING

The time is not far distant when the electrical dealer will be an important factor in the sale of electric ranges. In fact, in Southern California several dealers are now actively pushing the sale of ranges and more are contemplating doing so. Mr. D. Coldren of Coldren's Electric Shop, Riverside, California, has been for the past year aggressively selling ranges and has been the most successful of the dealers in this section.

First a capable range solicitor for two weeks made house to house calls on likely prospects and introduced the idea of electric cooking. The solicitor told of a demonstration that was to be held at the dealer's store and invited them to be present. Effective newspaper advertising announced the demonstration to the public and advised when and where it would be held. This demonstration was carried on for one full week by a competent lady demonstrator in the employ of the manufacturer and each afternoon and evening she also give a lecture on electric cooking. The demonstration and the lectures were well attended and a number of good prospects were secured.

A meeting was then held with the employees of the municipal plant at which they were properly instructed regarding electric cooking, were advised of the campaign and their cooperation was obtained.

The range solicitor, assisted by factory specialists, then carefully followed up the prospects secured at the demonstration and orders began to come in. When a range was sold the demonstrator called and instructed the user how to efficiently operate it. The ranges were sold at list prices on terms of 30% down and balance in six monthly payments, or for cash at list prices less a discount of 3%, and in each installation charges were made which carried a fair profit to the dealer.

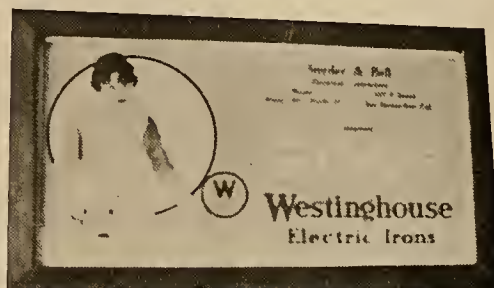
During the year the range solicitor was employed for six months and about \$300 was spent in newspaper advertising. Water heaters and air heaters were sold whenever possible and the result of this dealer's first year of activity on ranges was the sale and installation of forty-one ranges, ten large water heaters and seven installations of high wattage air heaters.

That the campaign was properly handled is proved by the fact that not one range has been taken out and there is not a single dissatisfied customer. The average monthly bill on the three cent rate has been less than three dollars. The dealer more than broke even on his first year of selling ranges and 1918 was certainly not a good range year. From now on this business will net the dealer a good profit and his entire business will benefit by the advertising the campaign has been to him, and due to the efforts of the dealer the central station will receive about \$2500 a year additional revenue.

IMPROVING THE APPEARANCE OF THE STORE

BY A. L. SPRING

It is often a problem to the dealer to know what to do to improve the appearance of a bare wall in his store. The San Diego Gas & Electric Appliance Company has solved the



One of the advertising cards in a simple frame

problem; they have made a bare wall attractive and at the same time have turned it into a good advertising medium. Manufacturers' advertising cards have been framed and hung on the wall like pictures as shown in the accompanying illustration. These cards can easily be removed from the frames



The bare walls of this store have been greatly improved in appearance by framing some of the attractive advertising material provided by manufacturers.

and new ones inserted so that if the dealer desires the cards can at all times advertise articles in season.

In my work as representative of the California Electrical Cooperative Campaign I have offered this suggestion to a number of dealers whose stores needed something of this kind. The accompanying cut shows a close-up of a street car card framed by Snyder & Bell, dealers in San Bernardino to whom the suggestion was given. They have made the frame of surfaced one-inch by two-inch redwood and have sprayed it gold with their fixture spraying apparatus.

There is no need of glass in front of these cards and frames are inexpensive.



VISIBLE support is what is needed

—Victory Loan

Meeting Notices for Electrical Men

(The outstanding feature of this issue, of course, must be the plans for the coming Coronado Conventions. Several other meetings of particular interest, however, have taken place during this two weeks period and are here reported. The annual meeting of the Electrical Credit Association of the Pacific Coast was one of these pleasant occasions. Extensive plans are under way for a successful meeting of the Westinghouse Agent-Jobbers at Del Monte. —The Editor.)

San Francisco Section, A. I. E. E.

At a meeting of the San Francisco Section, A. I. E. E., held at the San Francisco Engineers' Club rooms on Friday evening, March 28, 1919, a paper on Railway Electrification by W. F. Dietrich, which was published in the Journal of Electricity for Nov. 15, 1918 and March 1, 1919, was read. The paper represented the results of research by the National Fuel Administration during the war period, and has proven of wide interest. The Institute meeting was well attended and intensely interesting discussion took place. Those who participated in the discussion were Professor J. C. Clark, Stanford University; E. A. Palmer, Westinghouse Electric & Manufacturing Co.; W. J. Davis and A. V. Thompson of the General Electric Co.; F. H. Fowler, of the Forest Service; L. R. Jorgensen, consulting engineer; J. E. Woodbridge, Sierra & San Francisco Power Company; W. G. Vincent, Pacific Gas & Electric Company, and Robert Sibley, editor of the Journal of Electricity. At the conclusion of the meeting the following resolution was unanimously adopted:

"Resolved, That it be the sense of this meeting of the San Francisco Section of the A. I. E. E. devoted to the discussion of railway electrification, that a committee of eleven be appointed by the chairman of this section to investigate the problem of railway electrification and report to this section from time to time such data as may become available for offering definite conclusions on the subject of railway electrification.

"Resolved, furthermore, That this committee should have the following constitution of membership:

1. A representative of a power company.
2. An independent consulting electrical engineer.
3. A representative of the electrical engineering staff of a prominent transcontinental railway.
4. A representative of the electrical engineering staff of the Pacific Telephone & Telegraph Company.
5. A representative of the engineering staff of the California Railroad Commission.
6. A representative of the electrical engineering staff of the Forest Service.
7. A representative of the electrical engineering staff of the faculty of the University of California.
8. A representative of the electrical engineering staff of the faculty of Leland Stanford Junior University.
9. Three representatives at large.

Furthermore be it resolved, That in making his appointment the chairman be urged to appoint only such representatives on this committee as are willing to offer their services as a contribution to the good of the profession and are willing to put a reasonable amount of time into the problem to arrive at thorough and reliable conclusions."

Oregon Electrical Contractors and Dealers

The regular meeting of Oregon Electrical Contractors and Dealers for District No. 1 was held at the Imperial Hotel, Monday, March 24, 1919.

The Executive Committee reported having held meetings and being now established in the new offices of the association, and recommended to the meeting that it was the consensus of opinion of the Executive Committee that the members were not close enough and did not display enough

enthusiasm in the association work and that as the future seemed to be an era of much construction and prosperity, some means should be devised whereby the members could become more enlightened in the matter of submitting bids and the proposition of conducting a more open association, somewhat along the line laid out by Arthur Jerome Eddy in his work entitled "The New Competition." There was considerable discussion and the Executive Committee was instructed to proceed along this line and to endeavor to get results.

The State of Association committee reported in detail of its efforts in securing for the contractor-dealer the business which, in their opinion, he was entitled to, where now competition with the wholesaler exists. The committee reported quite extensive plans of action and said that it would take some time for the accomplishment of all it was seeking. The chairman asked the members to go on record in regard to their purchases of electrical supplies and material, and asked if the committee was successful in obtaining results, if they would pledge themselves in their purchases to patronize home industry and jobbers and wholesalers with established places of business in this territory.

It was moved and seconded that the secretary be instructed to see all the members in regard to this matter. The applications of the Sellwood Electric Supply Co. of Portland and the Standard Electric Co. of McMinnville, members of this district, were submitted and they were unanimously elected.

San Francisco Engineers' Club

Believing that community singing should not end with the war, the "Engineers' Glee Club" has been started by members of the Engineers' Club of San Francisco, as a nucleus for community singing at the local meetings of engineers. The first instruction rehearsal was held at the Engineers' Club, San Francisco, on Feb. 27th and the institution promises to prove worth while both to the participants and to the audience at the various engineering meetings.

American Welding Society

The first meeting of the American Welding Society was held on March 28, 1919, at the Engineering Societies Building, New York, and the Constitution and By-Laws were adopted as recommended by the organization committee. The following officers were elected:

President, C. A. Adams, Cambridge, Mass.
Vice-President (one year), J. M. Morehead, New York.
Vice-President (two years), G. L. Brunner, Utica, New York.

BUILDERS OF THE WEST—LI.



COLONEL H. M. BYLLESBY

As the president of seven great utility companies, the vice-president of three others, and a member of the directorate of seventeen companies in all, Colonel H. M. Byllesby has added to the utility life of the nation a distinct type of helpfulness achieved by no other individual in the evolution of efficient and economic utility service. To Colonel Byllesby—the executive, the soldier and the citizen—this issue of the Journal of Electricity is affectionately dedicated as a memorial to his lasting and enduring work in the upbuilding of the West.

Coronado Convention Plans



M. A. DeLEW, president of the California Association of Electrical Contractors and Dealers; prominent electrical contractor, San Francisco District.



SAMUEL KAHN, president of the Pacific Coast Section, N. E. L. A.; general manager of the Western States Gas & Electric Company.



TRACY E. BIBBINS, president of the Pacific Division, National Electrical Supply Jobbers' Association; president Pacific States Electric Company.



JOHN A. BRITTON, chairman of the Public Policy Committee, Pacific Coast Section, N. E. L. A.; vice-president and general manager of the Pacific Gas and Electric Company.

Due in substantial part to the broad vision and helpful work of these four men, backed by the organized associated activities they represent, the electrical industry in California, Nevada and Arizona, representing an invested capital of over half a billion dollars, has emerged from one of the most trying periods in the world's history, with energies that have expanded and increased under stress to such a degree that never before has the outlook of helpfulness been more brilliant for continued growth and service of the method electrical in the West, where in previous years so many world records in activity of this sort have been established.

PROGRAM

Joint Conventions at Hotel del Coronado, April 28-May 3

PACIFIC COAST SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION

CALIFORNIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS

PACIFIC DIVISION, ELECTRICAL SUPPLY JOBBERS' ASSOCIATION

Monday, April 28th

Meeting and Golf Play—Electrical Supply Jobbers Association.

Tuesday, April 29th

Meeting and Golf Play—Electrical Supply Jobbers Association.

10:00 a.m.—Meeting of Advisory Committee, California Cooperative Electrical Campaign, L. H. Newbert, Chairman.

7:30- 9:00 p.m.—Contractors' Executive Committee Meeting.

Wednesday, April 30th

All Day —Registration and Reception of Arriving Guests.

9:00-12:00 a.m.—Contractors' Joint Meeting of Committee on Supplies.

10:00 a.m.—N. E. L. A. Executive Committee Meeting.

3:00 p.m.—N. E. L. A. Opening Meeting. Ladies invited.

Address of Welcome: William Clayton. Response.

President's Address: Samuel Kahn.

Secretary's Report: Arthur H. Halloran.

Treasurer's Report: J. F. Pollard.

Report of Committee on Cooperation: H. F. Jackson.

Report of Membership Committee: Henry Bostwick.

Report of Accounting Committee: B. B. Stich.

Report of Engineering Committee: H. A. Barre.

Report of Commercial Committee: A. W. Childs.

Report of Publicity Committee: Ed. Whaley. Announcements.

4:00 p.m.—Reception for Ladies.

7:30 p.m.—Meeting of Retail Merchants, G. E. Arbogast, presiding.

8:30 p.m.—Motion Pictures. Informal Dancing.

Thursday, May 1st

9:15-12:00 a.m.—Commercial Committee Session Discussions.

"The Proper Training of the Sales Personnel," by Lee H. Newbert, Pacific Gas & Electric Company; J. F. Pollard, Sierra & San Francisco Power Company; I. W. Alexander, San Joaquin Light & Power Corporation.

"How Can the Electrical Industry Assist the Architect in Serving His Clients?" by J. O. Case, General Electric Company.

"Selling the Idea," by H. L. Harper, Western Electric Company.

9:15-12:00 a.m.—Engineering Committee Session Discussions.

Report of Committees on Insulators and on Line Safety Code, J. S. Lisberger.

"Interchange of Power between Southern California Edison Company and San Joaquin Light & Power Corporation," by G. R. Kenny, San Joaquin Light & Power Corporation.

"Relay Protective Systems," by G. E. Armstrong, Southern California Edison Company.

"Automatic Inductor Generator Plants," by E. A. Quinn, San Joaquin Light & Power Corporation.

12:15 p.m.—Convention Picture.

2:00 p.m.—Joint Meeting of Commercial and Engineering Sections. Paper by S. M. Kennedy—"The Man in the Street."

2:45- 5:00 p.m.—Commercial Committee Session Discussions. Papers

"Problems of Electric Cooking and Heating," by B. N. Maddox, Southern California Edison Company.

"The Contractor-Dealer of the Future," by John C. Rendler, Southern California Company.

"Appliance Sales Policy," by T. W. Simpson, Federal Sign System (Electric).

2:45- 5:00 p.m.—Engineering Committee Session Discussions. Papers

"Converting a Steam Plant to Standby Operation," by L. M. Klauber, San Diego Consolidated Gas & Electric Company.

"Kw-Hr. per Barrel of Oil, What Does It Mean?" by S. J. Lisberger, Pacific Gas & Electric Company.

"Powdered Fuel," by C. H. Delany, Pacific Gas & Electric Company.

5:00 p.m.—Swimming Tournament in plunge.

Evening Ball at Hotel del Coronado.

Friday, May 2nd

10:00-12:00 a.m.—Meeting of Electrical Contractors and Dealers.

9:00 a.m.—Visit to Army Aviation School.



VERDICT rendered — it was your war

—Victory Loan



H. A. BARRE, chairman of the Engineering Committee, Pacific Coast Section N. E. L. A.; electrical and mechanical engineer, Southern California Edison Company.



H. H. JONES, chairman of the convention committee, Coronado Conventions; general manager of the San Diego Consolidated Gas and Electric Company.



A. W. CHILDS, chairman of the commercial committee of the Pacific Coast Section, N. E. L. A.; assistant general agent, Southern California Edison Company.

To these three men, backed by their respective committees, has fallen the task of arranging the papers and preparing for the convention details at Coronado. How well and how excellently this work has been performed may be gleaned at a glance by running through the pages of this issue of the Journal of Electricity, which is replete with their handiwork.

2:00- 4:00 p.m.—Engineering Committee Session Discussions. Papers

"Extending the Range of Accuracy of Watthour Meters," by O. A. Knopp, Pacific Gas & Electric Company.

"Electric Welding," by John Hood, General Electric Company.

2:00- 4:00 p.m.—Commercial Committee Sessions Discussions. (Subjects to be announced later.)

4:00- 5:00 p.m.—General Business Session.

Report of Public Policy Committee.

Report of Nominating Committee.

Report of Resolution Committee.

Unfinished Business.

Closing Exercises.

7:30 p.m.—Banquet.

Toastmaster—Mr. William Clayton, United Light, Fuel & Power Company, Coronado.

Spakker of the Evening—Col. H. M. Byllesby.

Informal Dancing.

Saturday, May 3rd

Unfinished Business.

All of this day to be devoted to sports and entertainment.

SOME WHO WILL ATTEND

Alexander, I. W., San Joaquin Light & Power Corporation, Fresno
 Alvord, R. M., General Electric Company, San Francisco
 Anderson, F. A., U. S. Shipping Board, San Francisco
 Anderson, S. B., Pacific States Electric Company, San Francisco
 Ballard, R. H., Southern California Edison Company, Los Angeles
 Barre, H. A., Southern California Edison Company, Los Angeles
 Bennett, T. J., Rex Electric Company, San Francisco
 Bergman, L. John, Pass & Seymour, Syracuse, N. Y.
 Berry, W. S., Western Electric Company, San Francisco
 Bibbins, T. E., Pacific States Electric Company, San Francisco
 Boyd, F. E., General Electric Company, San Francisco
 Brainerd, W. F., California Electrical Cooperative Campaign, San Francisco
 Bullen, D. R., General Electric Company, Schenectady, N. Y.
 Bussman, H. T., Bussman Manufacturing Company, St. Louis, Mo.
 Case, J. O., General Electric Company, Los Angeles
 Chandler, A. E., California Water Commission, San Francisco
 Courtright, H. H., Valley Electrical Supply Company, Fresno
 Davis, C. C., California Electrical Cooperative Campaign, San Francisco
 DeLew, M. A., San Francisco
 Deming, W. M., Journal of Electricity, San Francisco
 Elliot, Albert, Sec'y Pac. Coast Sect'n, Elec. Supply Jobbers, San Francisco
 Eltringham, R. L., California Accident Commission, San Francisco
 Fagan, F. D., General Electric Company, San Francisco
 Fisher, R. E., Pacific Gas & Electric Company, San Francisco
 Goodwin, W. L., General Electric Company, New York
 Hall, W. Brewster, Pass & Seymour, Syracuse, N. Y.
 Halloran, A. H., Journal of Electricity, San Francisco
 Harris, D. E., Pacific States Electric Company, San Francisco
 Heise, Carl, Westinghouse Electric & Manufacturing Co., San Francisco
 Hillis, C. C., Electric Appliance Company, San Francisco
 Hood, J., General Electric Company, San Francisco
 Hopkins, H. C., Westinghouse Electric & Manufacturing Co., Los Angeles
 Hughes, Geo. A., Edison Electric Appliance Company, Inc., Chicago
 Kahn, Samuel, Western States Gas & Electric Company, Stockton
 Kennedy, S. M., Southern California Edison Company, Los Angeles
 Kirkland, H. B., American Conduit Mfg. Co., New Kensington, Pa.
 Lisberger, S. J., Pacific Gas & Electric Company, San Francisco
 Maxheimer, F. C., Home Specialty Co., Cleveland, O.
 Myrtle, F. S., Pacific Gas & Electric Company, San Francisco
 Osborne, G. C., Edison Lamp Works, Cleveland, O.
 Page, A. D., Edison Lamp Works, Cleveland, O.
 Pollard, Jas. F., Sierra & San Francisco Power Company, San Francisco
 Redpath, J. W., Sec'y Cal. Ass'n Contractors & Dealers, San Francisco
 Reid, H. C., Pacific Fire Extinguisher Co., San Francisco
 Rockefeller, E. W., Western Electric Company, New York
 Sawyer, L. P., National Electric Lamp Works, Cleveland, O.

Shreve, E. O., General Electric Company, San Francisco
 Sibley, Robert, Journal of Electricity, San Francisco
 Somers, Frank, Century Electric Company, San Jose
 Spring, A. L., Cal. Electrical Cooperative Campaign, Los Angeles
 Simpson, T. W., Federal Sign System (Electric), San Francisco
 Whitestone, S. L., General Electric Company, Schenectady, N. Y.
 Wishon, A. E., San Joaquin Light & Power Corporation, Fresno

Pacific Coast Gas Association

The first "Get-together Dinner" of the Association for the season 1919 was held at the Hotel Alexandria, Los Angeles, California, on Saturday, March 15, 1919, there being 135 members present, President Kuster presiding. During the serving of the dinner entertainment was provided and letters and telegrams read from those unable to be present.

One of the most interesting features was the reading of questions received in response to request, and the answers to same, and it is the intention to make this a feature of the second get-together dinner which will be held in San Francisco during the month of July.

Electrical Credit Association of the Pacific Coast

The fourteenth annual dinner and meeting of the Electrical Credit Association of the Pacific Coast was held at Tait's Cafe, San Francisco, April 3rd, with an attendance of forty-three members and guests. S. B. Anderson, president, acted as toastmaster. Addresses were made by Captain A. E. Graupner on "Observations at the Front," by C. C. Hillis on "The National Electrical Credit Association," by A. M. Irwin on "The Business Outlook," by C. E. Wiggin on "The Relation between the Credit and the Sales Departments," by F. P. Vose and A. H. Elliot.

Officers for the ensuing year were elected as follows:

President—H. J. Zweifel	Executive Committee—
1st Vice-President—R. Holtermann	F. A. Morton
2nd Vice-President—J. J. O'Reilly	C. W. Goodwin, Jr.
3rd Vice-President—H. C. Chapman	H. I. England

Reports showed the association to be in a flourishing condition and most successful in the conduct of its business.

The following were present:

Thomas Day Company—James T. Gates.
 Dunham, Carrigan & Hayden Company—C. E. Wiggin, F. A. Morton.
 Electric Appliance Company—C. C. Hillis, A. B. Cram, A. Meinema,
 H. Jensen, H. J. Zweifel.
 Electric Ry. & Mfrs. Supply Company—J. H. McClellan, Geo. Curtis.
 Garnett Young Company—E. C. Kinsey.
 General Electric Company—J. V. Anthony.
 Gilson Electrical Supply Company—C. Gilson, H. I. England.
 Holabird Electric Company—R. Holtermann, E. J. Duggan.
 Illinois Electric Company—S. M. Murray.
 National Carbon Company—F. G. Beck, F. P. Gillespie, C. P. Matthey.
 N. Y. Insulated Wire Company—L. E. Sperry.
 Pacific States Electric Company—S. B. Anderson, C. W. Goodwin, Jr.,
 H. R. Olson, Roy Worth, H. C. Chapman, Leon Van Atta.
 Roberts Manufacturing Company—H. J. Bayliss.
 Standard Underground Cable Company—D. S. Smith.
 U. S. Steel Products Company—Harry Rogers.
 Western Electric Company—E. J. Wallis, John Bray, L. J. Brown.
 Westinghouse Electric & Manufacturing Company—A. M. Irwin, C. E. Thompson.
 Westinghouse Lamp Company—W. C. Wurfel, Geo. Whitehead.
 Capt. A. E. Graupner, F. P. Vose, A. H. Elliot, W. P. Smith, W. M. Deming, A. H. Halloran.



The Serious Task of Passing on Credits is Lightened Once a Year at the Annual Dinner of the Electrical Credit Men of the Pacific Coast—this being a picture of the 14th annual affair where members expressed their credo in human nature.

WESTERN MEETINGS

San Francisco Electrical Development League—

April 7—Mr. Harrison of Wells Fargo Express Co.—
“Packing for Shipment by Express.”

Portland Sections, N. E. L. A. and A. I. E. E.—

April 7—J. W. Sadler, Great Northern Concrete Shipbuilding Company—“Concrete Ships.”

Engineers' Club, San Francisco—

April 3—Dr. W. F. Durand—“Personal Experiences in France.”

A. I. E. E., Denver Section—

April 9—Lieut.-Col. H. S. Crocker—“Construction of Army Supply Base at Brooklyn, N. Y.”

Jovian League, Los Angeles—

April 2—Capt. C. A. Gorelangton—“Some Things the Engineers Accomplished in France”; A. G. Morphy—“Over the Top in Oklahoma.”

A. I. E. E., Seattle Section—

April 15—L. F. Curtis, University of Washington—
“Analysis of Wave Form by Means of Indicating Instruments.”

LAYING A SUBMARINE TELEGRAPH CABLE

At the Feb. 4th meeting of the Portland Sections, N. E. L. A. and A. I. E. E., as reported in the last issue of the *Journal of Electricity*, the subject of laying some 18,000 feet of submarine cable across an arm of Puget Sound was discussed by H. J. Shephard from the Seattle office of the Pacific Telephone & Telegraph Company. A brief summary of the talk is here given. The cable described in the paper forms approximately .6 of the total submarine distance.

The cable consisted of 24 pairs of double paper insulated copper wire, specially twisted and arranged to eliminate cross talk conditions and maintain an electrical balance between the pairs. The lead sheath about this cable was one-quarter inch in thickness. The mechanical protection was secured by spiral windings of steel surrounded by a heavy protection of jute. The outside diameter of the cable including the jute wrapping was two and three-eighths inches. The maximum depth encountered in the channel was 800 feet and the pressure upon the cable was estimated to be 377 pounds per square inch. This represents so far as known the greatest depth in which paper insulated telephone cable has been successfully laid.

The care with which splices were made in this cable in order to maintain the electrical balance, the installation, and

at the same time secure a moisture proof sheath, as well as to replace the spiral windings in such a manner as to take the strain of the cable on the steel wire instead of allowing it to come upon the spliced lead sheath, while at the same time keeping the joints reasonably flexible, was shown in a very interesting manner by means of lantern slides. The method of handling this great length of $2\frac{3}{8}$ in. cable was very clearly shown also by means of lantern slides accompanying the speaker's description of the affair.

The channel across which the cable was to be laid had been carefully surveyed and platted on section paper. Also, buoys were carefully located so that the direct line could be followed and at frequent intervals it was possible to determine the exact location of the barge which was playing out the cable.

Of particular interest was the apparatus devised for supporting the cable as it left the barge and dipped into the water. The cable was supported in this device on pulleys grooved to fit the cable and so placed in the quadrant frame as to maintain the curvature of the cable as it left the reel and thereby avoid subjecting the cable to any additional and unnecessary strains.

The cable was wound upon a huge reel mounted on the barge, a donkey engine being used to fill the reel with the cable. Two tugs were used to handle the barge, one being lashed to the side of, and the other preceding the barge and towing it by means of a cable.

The playing out of the cable was governed by means of three friction brakes attached to the reel and hand-controlled. In addition a 100 horsepower generator was also geared to the reel after the donkey engine had been disconnected. The field of the generator was supplied by means of a rheostat. The load of the generator was carried through a set of heavy grids so connected that a variable load could be placed upon the machine. By means of the proper indicating instruments it was possible to control the load at will and to insure that the cable would be played out at a uniform rate and in accordance with the requirements as shown by the survey chart. This electric brake provided a most satisfactory method of controlling the reel and the friction brakes virtually amounted to emergency brakes.



INDICATE your claim to patriotism

—Victory Loan

The cable was run out over a wooden wheel rotating it by means of friction contact. The wheel was provided with a brush and contact point in series with a counter in an electrical circuit so that it was possible at any time to determine exactly the number of revolutions of the wheel and therefore the number of feet of cable which had been sent overboard. By means of this counter, the anchored buoys, and of the charted section of the channel, it was possible at any time to check the amount of cable laid with the amount which the record showed should be out at that point, and to be sure that

the brake was being handled in a proper manner. These checks made at various points along the route indicated a very close relation existing between the actual and estimated lengths of cable, and at the end of the laying of the cable the two values checked within a relatively few feet of each other.

This certainly exemplified very clearly the exceptional engineering skill used in the matter of this submarine cable installation. It should also be mentioned that telephonic communication was maintained through the cable at all times.

“Kilowatt Hours per Barrel of Oil” Diagrams

BY S. J. LISBERGER

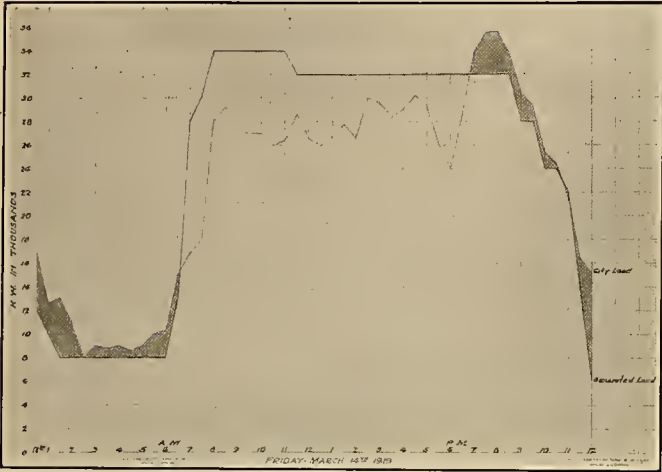


Figure 1

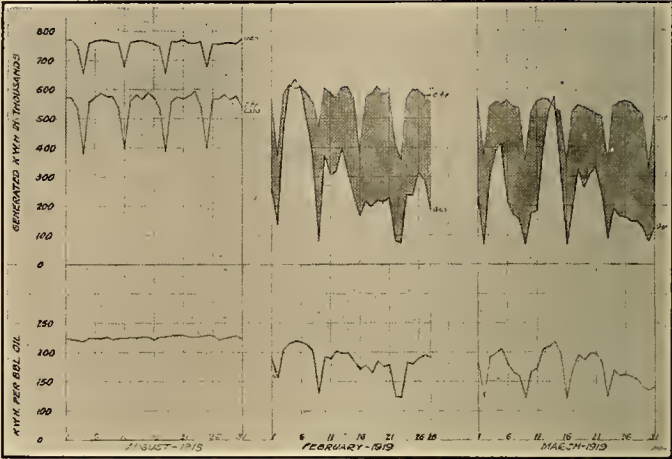


Figure 4

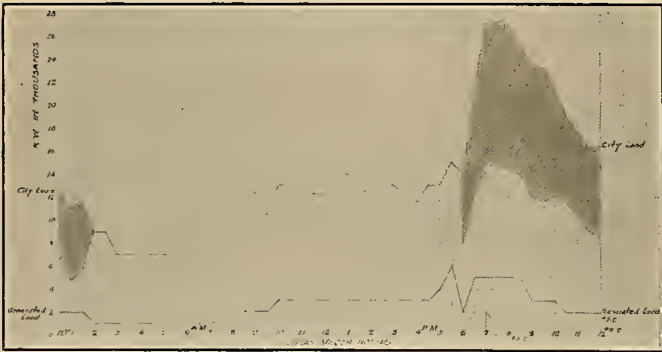


Figure 2

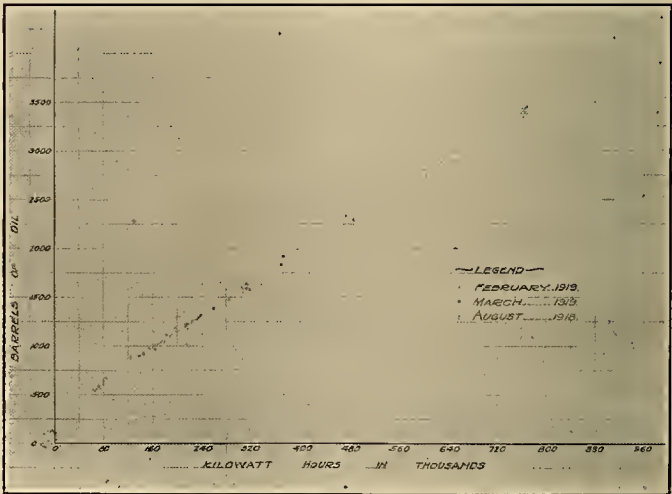


Figure 5

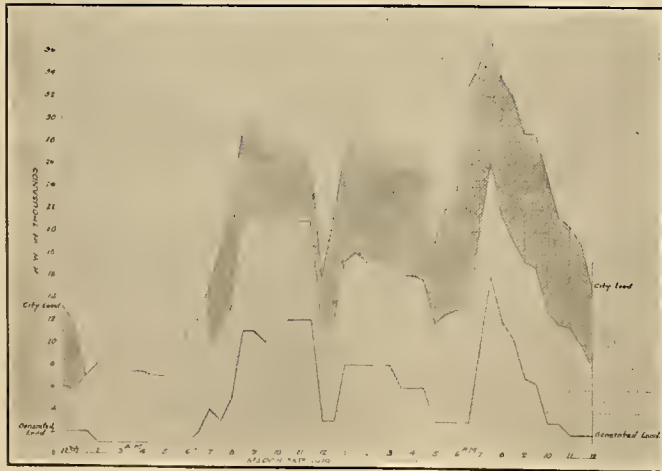


Figure 3

The above charts illustrate the article on “Kilowatt Hours per Barrel of Oil” by S. J. Lisberger, appearing on page 363 of this issue. Figures 1, 2 and 3 are daily charts for March 14, 16 and 28, showing the fluctuations through the day. Figure 4 shows the monthly curve of a station delivering the three different types of service brought out in Mr. Lisberger’s article. The lower curves show the irregularities in the kw-hr. generated per barrel of oil even in this short period and the unsatisfactory basis for comparison which the term furnishes. Figure 5 is a sample of the alternative method of charting suggested which admits of greater accuracy in comparison.

NATION'S ELECTRICAL WHOLESALERS TO DISCUSS BUSINESS FUTURE AT DEL MONTE

BY M. EMMILINNE PITT

The Westinghouse Agent-Jobbers Association are making elaborate plans for their annual convention at Del Monte, California, May 4 to 11. Among those who will address the convention are John J. Jackson, general attorney for the Westinghouse Electric & Manufacturing Company and the Agent-Jobbers' Association, who will speak on "Motives in



SAMUEL ADAMS CHASE, a man of broad vision in the merchandising of electrical ware, who will lead in the discussion of the Westinghouse Agent-Jobbers' Convention at Del Monte, May 4-11, 1919.

Merchandising. Samuel Adams Chase, special representative of the Westinghouse Electric and Manufacturing Company, a man who has by extended travel the world over, by visiting the business places of jobbers from coast to coast and by an intensive and exhaustive study of electrical merchandising become an authority, will also speak. William L. Goodwin, the originator of the "Goodwin Plan," will explain its meaning and significance.

Officers of the association are: President, J. S. Schmidt-

bauer, vice-president of the Julius Andrae & Sons Company, Milwaukee, Wisconsin; vice-president, S. L. Nicholson, assistant to vice-president of the Westinghouse Electric & Manufacturing Company, Pittsburgh; secretary, Arthur J. Cole, vice-president, of the McGraw Company, Omaha, Nebraska; treasurer, J. E. McClernon, president of the Northwestern Electric Equipment Company, New York; assistant secretary, H. T. Pritchard, Westinghouse Electric & Manufacturing Company.

The program for the convention has not yet been definitely announced, but it is assured that some of the most prominent men of the East are to participate as well as electrical jobbers on the Pacific Coast. J. C. Schmidtbauer, vice-president and manager of the Julius Andrae & Sons Company of Milwaukee, who is recognized for his stand on "Justice and Service to the Customer," will preside at the convention. J. C. McQuiston, manager of the department of the Westinghouse Electric & Manufacturing Company, perhaps the leading exponent in the electrical world of "Institutional Publicity as a National Advertising Policy," will direct the entertainment of those attending. Other prominent men who will be at Del Monte are: S. L. Nicholson, assistant to vice-president of the Westinghouse Electric & Manufacturing Company; J. E. McClernon, president of the Northwestern Electric Equipment Company of New York City; H. T. Pritchard, of the supply department of the Westinghouse Electric & Manufacturing Company; T. Julian McGill, of Chicago; H. R. Carroll, of the Carroll Electric Company, Washington, and many others.

Some of the members of the association from the Coast who will take an active part at Del Monte are:

K. E. Van Kuran, Los Angeles
C. B. Hall, Los Angeles
C. E. Heise, San Francisco

Carl L. Wernicke, Portland
C. M. Will, Portland
P. J. Aaron, Seattle

W. R. Dunbar, San Francisco
R. A. Balzari, San Francisco
F. N. Averill, Portland
W. D. McDonald, Seattle
S. H. Taylor, San Francisco

H. D. Howell, Seattle
H. C. Hopkins, San Francisco
D. C. Pence, Los Angeles
C. V. Aspinwall, Seattle
J. H. Jamison, Los Angeles

The Westinghouse Agent-Jobbers' Association have chartered a special train for the trip which will leave Chicago Sunday, April 27, arriving at Del Monte May 4. They expect to spend a day at the Grand Canyon and one day in Los Angeles.

Samuel Adams Chase, special representative of the Westinghouse Electric and Manufacturing Company, is general chairman of the convention arrangements, but the details of hotel arrangements, program and entertainment at San Francisco and Del Monte are in charge of Carl E. Heise and Samuel H. Taylor of San Francisco, and for Los Angeles K. E. Van Kuran and C. B. Hull of that city, and other committees will be appointed to take good care of the delegates and guests at Portland, Seattle, Salt Lake City and other points en route.



W. L. GOODWIN, the noted founder of the "Goodwin Plan," who will tell again to his old-time friends in the West, his message of cooperative helpfulness.

WESTINGHOUSE AGENT-JOBBERS

H. J. Gundlach, Manager Electrical Dept., Mine & Smelter Supply Co., Denver, Colorado.
J. C. Schmidtbauer, President, Westinghouse Agent-Jobbers' Association and Vice-President Julius Andrae & Sons Co., Milwaukee, Wis.
J. E. McClernon, President Northwestern Electric Equipment Company, New York, N. Y.
F. W. Woolrich, President Commercial Electric Supply Company, Detroit, Michigan.
Walter S. Blue, Montana Electric Company, Butte, Mont.
W. S. P. Mayo, Tower-Binford Co., Richmond, Va.
Samuel H. Taylor, President Electric Railways & Supply Co., San Francisco, and Toastmaster Westinghouse Banquet.
Max McGraw, President the McGraw Co., Omaha, Neb.
F. N. Averill, President Fobes Supply Co., Portland, Oregon.
F. Riebel, Jr., Gen. Mgr. Commercial Electric Supply Co., Detroit, Mich.
N. G. Harvey, Vice-President Illinois Electric Co., Chicago, Ill.
G. H. Miller, Manager Tel. Electric Co., Houston, Tex.
C. B. Hawley, Gen. Mgr. Inter-Mountain Electric Co., Salt Lake City, Utah.
C. B. Hall, Sec'y-Treasurer Illinois Electric Co., Los Angeles, Cal.
G. H. Smith, Penn Electric Engineering Co., Scranton, Pa.
G. M. Stuart, President Stuart-Howland Co.
H. R. Carroll, Carroll Electric Company, Washington, D. C.
L. D. Carroll, Carroll Electric Company, Washington, D. C.
W. B. Satterlee, Satterlee Electric Co., Kansas City, Mo.
F. D. Phillips, President Central Telephone & Electric Co., St. Louis, Mo.

WESTINGHOUSE REPRESENTATIVES

S. L. Nicholson, Assistant to Vice-President, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.
W. D. McDonald, District Mgr. Westinghouse Electric & Manufacturing Company, Seattle, Wash.
K. E. Van Kuran, Manager Westinghouse Electric & Manufacturing Company, Los Angeles, Cal.
T. Julian McGill, District Manager Westinghouse Electric & Manufacturing Company, Chicago, Ill.
Walter Cary, Vice-President, Westinghouse Electric & Manufacturing Company, New York.
Merrill C. Morrow, Assistant to Manager, Supply Department, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.
J. M. Curtin, Industrial Department, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.
J. C. McQuiston, Manager Department of Publicity, Westinghouse Electric & Manufacturing Company, and Chairman of Transportation, Westinghouse Agent-Jobbers' Convention, Del Monte, California.
Carl M. Heintz, Westinghouse Electric & Manufacturing Company, Los Angeles.
John J. Jackson, General Attorney, Westinghouse Electric & Manufacturing Company and Agent-Jobbers' Association.
J. J. Gibson, Manager Supply Dept., Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.
L. M. Cargo, Denver Office Westinghouse Electric & Manufacturing Co.
W. W. Briggs, District Manager Westinghouse Lamp Company, New York.
C. E. Heise, Manager San Francisco Office, Westinghouse Electric & Manufacturing Company.
W. C. Wurfel, Westinghouse Lamp Company, San Francisco, Cal.



ENERATE the victors—but support them, too

—Victory Loan



OFFICERS OF THE WESTINGHOUSE AGENT-JOBBER'S ASSOCIATION

Books and Bulletins

Repairing the German Ships

The romantic story of how the German ships which their mutilators expected would take years to repair were put in shape within five and a half months time by the use of electric welding is told in an interesting booklet published by the Wilson Welder & Metals Company, Inc., of New York.

Catalog of Electric Supplies

A most complete catalog of their line of electrical supplies has been published by the Electric Railway & Manufacturers' Supply Company, jobbers and manufacturers of electrical merchandise, of San Francisco. The book is attractively gotten up with buckram binding in corn color and consists of over 1200 pages of illustrated matter. It is a complete and up-to-date reference book of standard electrical

supplies with price listings for the convenience of customers although, of course, these are subject to change without notice. The following letter received by the company is indicative of the high excellence of the catalog as a business document:

Electric Railway & Manufacturers' Supply Co:

I think you will be interested to know that we have selected your new catalog as one of two leading catalogs of electrical supplies at the request of the Graduate School of Business Administration of Harvard University, to be included in their library—and are sending them a copy of your catalog accordingly today.

Yours truly,

R. R. DONNELLEY & SONS CO.

Powdered Fuel Systems

The West is specially interested in powdered fuel and in consequence in a bulletin recently issued by the Quigley Furnace Specialties Company, Inc., which describes the details of equipment and applications of the Quigley Powdered Fuel System for preparing, distributing and burning powdered fuel. Photographs from actual installations well illustrate the steps in the process.

LATEST IN EVERYTHING ELECTRICAL

(One of the most interesting developments of the war from an electrical standpoint is the advance which was made in practical telephony. The story of the anti-noise transmitter which played such an important part in this development is here told by Capt. Clark, who as Captain of Engineers and later as Railway Regulating and Liaison Officer with the 30th Artillery Brigade saw service at Verdun through both the St. Mihiel and Argonne drives.—The Editor.)

THE MAGNAVOX ANTI-NOISE TELEPHONE

BY CAPTAIN ADDISON N. CLARK

That great wars breed great inventions is a truism much in evidence in these times. That such a war as the late conflict in Europe likewise stimulates development in existing apparatus and machinery, and creates undreamed uses for them—uses that often are practical after peace has come—is one of the few factors that in any measure compensate for the horrors.

For various reasons, into which it is unnecessary to go here, few radical developments had taken place in the

The "Magnavox," original invention of Messrs. Jensen and Pridham, which, as shown here, projected to a distance of seven miles in Napa Valley the music of the phonograph connected with it. It was one of these that later permitted Mayor Rolph of San Francisco to speak directly and without effort to a throng of over 75,000 people in the open air.



field of telephony during the last quarter century. Suddenly the needs of war called into being methods of intercommunication hitherto undeveloped; and now we have the spectacle, for example, of the Secretary of the Navy conversing by wireless with the President of the United States, from the American mainland to a ship in mid-Atlantic. The use of the wireless telephone as a means of communication between the ships of a fleet is no longer a novelty. Nor is it a novelty to read of wireless telephone communication between the pilots of aeroplanes in flight—though it is only yesterday, industrially speaking, that the phenomenon of flight itself, in a heavier-than-air machine, was a front-page story in the daily press and excited the public mind as did the advent of the steam engine or the first transatlantic cable.

Because of the natural need for rigid secrecy in all matters dealing with war material, prior to the signing of the armistice, it has not been known save in a limited circle that it was a Pacific Coast manufacturing concern that won a most enviable record in the production of wireless telephone transmission for inter-aeroplane communication. Nor has it been known that, coincidentally with that achievement, the same California organization was awarded important contracts by the Bureau of Steam Engineering, United States Navy, for installing its "Anti-Noise" wireless telephone equipment on sea-planes for coast patrol and counter-submarine work, both in American and European waters. Both the French and British governments were also heavy purchasers and users of Magnavox equipment for sea-plane wireless telephony during the war.

Entirely on the merits and efficiency of performance of its new balanced-diaphragm Anti-Noise telephone transmitter, the Magnavox Company of San Francisco, a corporation young in the telephone field but now a powerful factor in the future of telephony through the recent developments of its engineers, stepped into a prominent place in the supplying of transmitters to the United States government for the exacting work of aeroplane intercommunication during flight.

That this Pacific Coast organization, barely known before America entered the great war—and then only through its development to a commercial basis of its electro-dynamic loud-speaking telephone receiver known as the "Magnavox"—has leaped into the field as such a powerful factor in the



The Magnavox Anti-Noise Transmitter as supplied to the United States Signal Corps for wireless telephony between aeroplanes and from 'planes to the ground; also between pilot and observer. Observe, in this set, the striking openness of the transmitter diaphragm on all sides.

telephone world, is one of the most striking of the innumerable romantic industrial developments of the war. And that the Magnavox Company, now that the war is over and the world of commerce must absorb its products, is aggressively going ahead and building a modern factory to supply the daily increasing demand for telephone apparatus that is absolutely immune from the effects of extraneous noise and disturbance, is one of the outstanding features in California's industrial development today.

Like so many inventions that have revolutionized industry, the Anti-Noise transmitter developed by Peter L. Jensen and Edwin S. Pridham, engineers of the Magnavox Company and pioneers in the adaptation to commercial use of the electro-dynamic principle of telephone reception, is extremely simple.



ENT that patriotism you talked about

—Victory Loan

When one who has a lively memory of the exasperation incident to trying to carry on a telephone conversation against outside noises of any sort—from the racket of riveting hammers on the steel building next door to the wailing of an infant in the next room—tries to visualize some scheme for eliminating from the line all sound save that of his own and the other person's voice, there arise visions of complicated retardation coils and sound-proof face masks and the like; not to mention involved and mysterious wiring. And with these preconceptions in mind, the first glimpse of the



E. S. Pridham, co-inventor of the Magnavox and the Anti-Noise Transmitter, demonstrating the new Model B-2 equipment, a peace-time development of the aeroplane anti-noise telephone. With this desk stand equipment, it is possible to telephone without annoyance from noise, in a boiler shop or alongside the open exhaust of a gas engine. A sound-proof booth is unnecessary.

Magnavox Company's device that has made undisturbed telephone communication possible under the most harrowing conditions of outside noises and disturbances, is apt to produce a distinct mental jolt. For, with the exception of the light aluminum protecting case and, in the case of the apparatus for inter-aeroplane communication and similar uses, the small brackets that hold the instrument at the proper distance from the operator's mouth, the whole device would almost go into the case of an Ingersoll watch.

The development of the Anti-Noise transmitter as it exists today, and the success that has attended every Army and Navy trial of the instrument and every practical demonstration of it, are due to the daring of Jensen and Pridham, its inventors. For, instead of going at the problem from the only too natural angle of attempting to exclude outside noise from the diaphragm, they boldly stripped from the essential mechanism of the carbon granule transmitter—the diaphragm and the "button"—every encasement whatever likely to exclude a bit of the extraneous racket. In other words, they threw open the doors and let all the noise in. However they opened both the front and back doors, as it were. That is, they allowed the mixture of sound waves equally free access to both sides of the diaphragm. The result was a transmitter that is immune from all influence save that to which it is desired it shall be susceptible—the voice of the person using it—even though the exhaust of two Liberty motors is thundering three or four feet away, or a hundred men are riveting the steel shell of a steamship entirely surrounding the instrument.

To illustrate the simple principle involved, imagine a huge flat gong of the Chinese tom-tom type, suspended by one edge. Then imagine the gong being struck on both sides simultaneously by hammers of equal weight, the blows being equal in force. The gong will not vibrate. Then imagine

either a small supplementary hammer striking one side of the gong along with one of the two hammers—or, what amounts to the same thing, a slight increment in the weight of one of the hammers or in the force of its blow. The gong will then vibrate, in direct measure to the additional impulses on one side.

The effect of the twin hammers on the gong is analogous to the effect of extraneous sound waves, due to any nearby noises, on the transmitter diaphragm (since the sound waves are freely admitted to both sides of the diaphragm). In practice, as in theory, they set up no vibrations. Therefore they cause no "side-tone," as transmitter disturbance is designated in telephone parlance. The diaphragm is left free to vibrate solely to the directed voice waves, from the lips of the operator, impinging against one side only.

It is this amazingly simple device, then, that has in a way revolutionized the last quarter-century's painstaking work in transmitter development, and by sheer infallibility of its results under the most grilling Signal Corps tests compelled its acceptance and installation in Liberty aeroplanes as a means of communication from 'plane to 'plane, from 'plane to ground, and from pilot to observer in the same 'plane.

Then came the signing of the armistice with the central powers, and the inevitable cessation in the manufacture of thousands of war-born devices. Many such products were instruments of warfare alone, and the factories making them had to turn to something entirely different to keep their wheels turning and their operatives busy. Some, however, possessed such apparent peace-time commercial value—born though they were of war and its needs—that, after the brief "breathing spell" following the signing of the armistice, and a short period of survey of commercial outlook and possibilities, their makers saw open before them a field even more vast than war necessities had provided.

The Magnavox Anti-Noise telephone transmitter is so evidently of this latter class that already less than six months after the end of hostilities, the demand for apparatus equipped with it is taxing the factory of the company at San Francisco, and work is well under way towards the construction of a thoroughly modern plant in East Oakland. It is expected that the new factory will be completed and in operation by midsummer, ready to turn out Anti-Noise telephone equipment for factory and office use fast enough to meet for a time at least the rapidly increasing demand for telephones that can be used without hindrance or exasperation whatever noise exists.

The engine room and boiler room of a steamship are typical examples of places where the use of an ordinary telephone transmitter would be entirely out of the question. The fact that just now the Magnavox Company is working overtime filling orders from the United States Shipping Board, for complete equipment to install on new ships, gives some conception of the possibilities of the Magnavox equipment. The instruments so furnished are for communication between the bridge of the vessel and the compartment aft in which is located the mechanical steering gear—just over the rear of the propeller shaft, and one of the noisiest places on a vessel. In case of mishap to the steering apparatus on the bridge, communication is immediately established from the bridge to the steering engine compartment, by means of the Magnavox standard Anti-Noise marine telephone equipped with the leather helmet of the type used in war-plane work; and the officer on the bridge then directs the engine operator who, with the equipment on his head, is free to devote his entire attention to the control of the steering engine.

The places where such an equipment as the newly-developed Magnavox Type B-2 desk set will find application are almost without number. Boiler works, garages, machine

shops, piano stores, newspaper offices, offices where typewriters are constantly hammering, offices adjacent to steel buildings under construction—these are but a minor list of places where the Anti-Noise transmitter already has been proven a preventive of telephone noise troubles.

The freedom from inductive disturbances of the set that combines the Anti-Noise transmitter with the Magnavox saturated-field electro-dynamic receiver has brought it to the attention of power line engineers as a relief from the



This is all there is to the Magnavox Anti-Noise Transmitter as applied to war aeroplane sets during the war. Take away the brackets and the aluminum case and the whole thing would go into the case of a watch.

harassing conditions that attend the carrying of telephone lines on the same poles or towers with alternating current power lines, and in all alternating current electric light and power stations. This field alone promises wide development in the use of Magnavox apparatus.

Persons partly deaf, or even only moderately hard of hearing, have found in the Magnavox Anti-Noise equipment a relief from virtually all of their troubles in the use of the telephone. The ear that is slightly deaf has its great trouble in the separation of the essential sounds of the conversation from the side-tones or extraneous sounds, when the ordinary solid-back telephone transmitter and common form of electromagnetic receiver are used. Such people who have tried the combination of the Anti-Noise transmitter and Magnavox electro-dynamic receiver declare that it is indispensable to their free use of the telephone.

While it is impossible, within the limits of this article, to discuss at length the historical development of the "Magnavox," or intensive, loud-speaking telephone transmitter and projector, it will be of interest to add that it was the outgrowth of the formation of a friendship, nine years ago, between two young inventors, neither of whom then could speak the other's language.

Edwin S. Pridham, Californian and Stanford graduate electrical engineer, and Peter L. Jensen, formerly associated with one of Denmark's most famous inventors, Dr. Valdemar Poulsen were thrown together on the engineering staff of the Federal Telegraph Company of San Francisco. Dr. Poulsen, one of the outstanding figures in wireless telegraph development, had sent young Jensen to San Francisco to assist in introducing the Poulsen arc system of wireless telegraphy. It was Jensen and Pridham who erected and put into operation the first station in the United States employing this now widely-used and successful system, of which it is sufficient to say that it is now acknowledged to be the most efficient and practical for long-distance radio-communication, and that it was the system employed by the United States Government for keeping General Pershing's headquarters in France in direct touch with the War Department at Washington.

Late in 1910 and early in 1911 Pridham and Jensen visited Europe together, and conferred with many European wireless telegraph pioneers and experts. On their return in 1911 they interested Richard O'Connor of San Francisco, a retired capitalist, in equipping for them an experimental laboratory for the development of ideas gained abroad. It was in this laboratory, at Napa, while working out the problem of a possible improvement of the telephone receiver—usually considered as one of the most sensitive and simple

of all electrical instruments—that they struck out in a new direction in telephony and developed the saturated-field electro-dynamic type of receiver, with a moving coil vibrating across traversing lines of magnetic force. This instrument shortly thereafter was developed into the loudest-speaking instrument of telephone history, given the singularly appropriate name of "Magnavox" (from the Latin, "great voice") and soon brought to a basis of commercial utility.

It was one of these instruments that, concealed behind a pillar of the new San Francisco city hall, enabled Mayor Rolph to speak to a vast out-door audience of over 75,000 people in the Civic Center, on Christmas Eve, 1915, and be heard by every one in the throng, as well as by persons in the windows of apartment houses seven blocks away. Sailors on the old battleship "Oregon," anchored off the city in San Francisco Bay, danced on the decks to the music of a phonograph on the Tower of Jewels at the Exposition, projected across the water by the Magnavox. Residents of the city of Napa, during the earliest experimental stages of the instrument, used to ring up the laboratory and request their favorite opera selections.

That such an instrument should have vital commercial value and manifold uses was apparent from the outset; and, with an intervening stage wherein the Commercial Wireless and Development Company (the original corporation formed by Jensen, Pridham and O'Connor) was re-named The Magnavox Company, the latter corporation, retaining its name, was merged with the Sonora Phonograph Company in the wake of the successes of that organization before the Awards Committee of the Panama-Pacific Exposition. It was this merged organization that, continuing the experimental and research work of Pridham and Jensen which had produced such striking developments, gave to the world what in all conservatism has been called, by engineers and scientific men, and by Army and Navy experts of the United States and foreign governments, "one of the most significant developments in telephony during the last quarter of a century"—the Magnavox Anti-Noise transmitter.

TRADE NOTES

L. John Bergman, credit manager of Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., is calling on the trade in the Coast States. Mr. Bergman has long been associated with the firm of Pass & Seymour and has made an intimate study of the relationship between the buyer and seller. His trip to this section of the United States will, no doubt, be richly productive in data and optimism. Mr. Bergman is planning with W. Brewster Hall to attend the Coronado Conventions the last of April.

Sales Conference —

On March 20, 1919, sales agents from Los Angeles, San Francisco, Seattle and other Pacific Coast centers in the employ of John A. Roebling's Sons Company met in San Francisco in conference.



VENTURE a little on the war — it's won

—Victory Loan

NEW ELECTRICAL DEVELOPMENTS

(The consummation of the electric railway deal in Seattle, the starting of actual work on the power developments planned in the Pacific Central region and in the Southwest, and numerous plans for electric light plants in the towns and cities of the Inter-mountain District are the features of the past two weeks' activities in matters electrical.—The Editor.)

THE PACIFIC NORTHWEST

VANCOUVER, B. C.—The Jenkins Electric Company has been incorporated for \$10,000.

SEATTLE, WASH.—The Puget Sound Traction Light & Power Company, 7th and Olive streets, will alter the waiting room at 601 Olive street at a cost of \$5,000.

SEATTLE, WASH.—A bill has been introduced in the city council authorizing the city lighting department to complete the renewals and repairs to Pipe Line No. 1 and appropriating \$10,000 therefor.

WENATCHEE, WASH.—W. L. Chrysler of Wilbur, Wash., has bought out the Root Electric Company at Wenatchee, Wash., formerly owned by Jose & Downey, and will conduct the business in future.

SPOKANE, WASH.—All the property rights and franchises of the Spokane Heat, Light & Power Company once valued at \$2,000,000, will be sold under the hammer at the door of the plant on April 21 at 10 o'clock a.m.

SEATTLE, WASH.—Bids will be received by the county commissioners up to May 5, 1919, at 10 a.m., for an electric exhaust blower in the basement of the county-city building. Plans may be examined at the office of the county commissioners.

YAKIMA, WASH.—N. C. Richards, president of the Yakima Valley Transportation Company, Yakima, Wash., has filed with the public service commission an amended schedule of street car fares for the city passenger lines, providing for a 10-cent fare, with the possibility of buying tickets for 8 cents and a school children's rate of 4 cents.

SEATTLE, WASH.—A warehouse 220 x 56 feet will be constructed by Stone & Webster Corporation, Stuart building, at a cost of \$15,000, for storing the machinery and equipment owned by the Puget Sound Traction Light & Power Company not taken over when the city purchased the street car systems. The roof of the building will be supported by heavy-timbered trusses.

SEATTLE, WASH.—In order to complete the municipal elevated railway the city council has taken steps to offer the remaining \$150,000 of a \$500,000 bond issue authorized for the project, a resolution has been introduced directing the city comptroller to offer such securities and a bill was introduced in council providing for the completion of extensions and betterments to the existing municipal street railway and appropriating \$148,201.96 therefor.

SEATTLE, WASH.—A factory for the making of marine electrical equipment is to be located here in the near future by the Horne Manufacturing Company of Brooklyn, according to an announcement by the industrial bureau of the Seattle Chamber of Commerce and Commercial Club. The company has established its western offices at 222 Grand Trunk Pacific Dock, Seattle. M. E. Weeks and A. A. Harris, members of the company, are on the ground. Incorporation articles in the state were applied for under the name of the Horne Manufacturing Company of Washington.

SEATTLE, WASH.—The city is to add extensively to its light and power system in the near future. New lines will be constructed for the purpose of street lighting and furnishing light and power to business and residence districts. A large part of the funds will be used to prepare for the additional current coming from the Cedar River plant and the

Skagit plant. The substation at Ballard will be equipped, also the industrial substation on Spokane street and tie-lines will be constructed covering substations. The plan to be ultimately carried through is to bring the Cedar River current to the Spokane street substation on Spokane street instead of the substation at 7th avenue and Yesler Way, which will become a distinct station with a lower voltage for the main business section. Proceeds from the sale of \$750,000 utility bonds will be available within a few days for this purpose.

THE PACIFIC CENTRAL DISTRICT

MOUNTAIN VIEW, CAL.—The board of trustees have expressed their approval of a municipal park, lighting and gas plant.

COALINGA, CAL.—The city has been offered the plant of the Coalinga Gas and Power Company for \$40,000. The matter is in the hands of the city engineer to appraise the property.

SACRAMENTO, CAL.—Application has been made by the Sacramento Northern Railroad before the State Railroad Commission to make permanent its order issued in 1913 temporarily suspending the railroad's branch between Chico and Hamilton.

BAKERSFIELD, CAL.—Steps were taken at a meeting of power-users' representatives of Kern, Tulare, Kings and Stanislaus counties, held at Tulare City, to organize the San Joaquin Valley Public Utilities Association. Jay A. Hinman was appointed chairman for Kern county.

BAKERSFIELD, CAL.—A meeting was held April 12 at Mojave to take steps to irrigate 250,000 acres of land around Mojave, Inyokern, Fremont and Castle Rock by impounding waters of Owens River, Red Rock, Pine Tree and Jawbone canyons. Reservoirs will be built.

PLACERVILLE, CAL.—It is understood the Western States Electric Company contemplates starting work soon on its 30,000 horsepower hydroelectric plant. This will be constructed in three 10,000 horsepower units, the first to be started as soon as weather conditions permit.

BAKERSFIELD, CAL.—The Southern California Edison Power Company is rapidly completing its plans for an early start on its new \$20,000,000 power plant on the upper Kern river. More than 2000 workmen will be employed on the project, which will require two or three years in building.

OAKLAND, CAL.—The application of the Great Western Power Company for a new trial of the case in which the city of Oakland was awarded an \$80,000 judgment has been denied. A technical error in the records, amounting to \$12, which was one of the arguments for the new trial, will be settled by an agreement.

NEWCASTLE, CAL.—In connection with the movement for the establishment of great irrigation projects by the state, it is interesting to note that the state engineers have been making inspections in Placer county of prospective reservoir sites and water supplies. It is stated that the Bear River project of Dr. J. L. Rollins and associates has been inspected by the engineers.

OROVILLE, CAL.—Lumber for the construction of the first camp of the Great Western Power Company at the site of its proposed Caribou plant, two miles east of Belden, has been shipped from Oroville recently. It is expected that

construction work will be well under way this summer. The first dam is to be built near Sheep Rocks, four miles up the river from Copper City, and the second dam is to be 12 miles higher up near the mouth of Potem Creek.

SONORA, CAL.—Surveyors are busy contouring the proposed dam at the Priest portal of the 14-mile tunnel which is to be a part of San Francisco's aqueduct. The dam will be constructed of the material taken out of the tunnel and will be faced with concrete. From the dam at the tunnel a conduit will take the water to the proposed Moccasin creek electric generating plant, from which point it will be conveyed through a pipe line to the big city by the bay.

SAN FRANCISCO, CAL.—Lars R. Jorgensen, of San Francisco, has been granted by the State Water Commission the unappropriated flow to the extent of 50 cubic feet per second of the waters of the North Fork of North Fork, Yuba River, for power purposes. The permit also includes 100 cubic feet per second of the waters of the North Fork, Yuba River, tributary of Yuba River, Sierra county, for power purposes, and further water for agricultural purposes.

RIPON, CAL.—The New England California Corporation of Ripon has applied for 3 cubic feet per second of the waters of the Stanislaus River, San Joaquin county, tributary to the San Joaquin River, for agricultural purposes. The applicant will install a 6 inch centrifugal pump under a head of 42 ft. and divert water in three ditches, .4, .9 and 1.2 miles long. The amount of water to be stored is 9.21 acre feet. Water will be used on 2550 acres.

THE PACIFIC SOUTHWEST

OXNARD, CAL.—The city trustees have voted to build a municipal gas plant, to cost \$140,000.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Corporation reports as its net income for the year ending Dec. 31, 1918, \$733,130.

LOS ANGELES, CAL.—A fire in the Edison substation at El Camino Real and Beryle streets, Redondo Beach, damaged the building and apparatus to the extent of \$4,000.

HERMOSA BEACH, CAL.—The Southern California Gas Company will extend mains between Camino Real and Prospect avenue, Pier avenue and 19th street. Work is to begin at once.

PASADENA, CAL.—The city commission voted unanimously to accept the bid of the department of public works of Los Angeles to supply electrical energy to Pasadena at wholesale prices for a term of 15 years.

VISTA, CAL.—At a meeting of property owners held at Vista it was decided to circulate a petition to form an irrigation district to comprise the lands between Oceanside and Escondido, tributary to the San Luis Rey river.

SAN PEDRO, CAL.—The Pacific Electric Railway Company is laying stakes for the proposed extension of the La Rambla car line which will be extended north in Bandini street to the canyon north of the Peck holdings.

SAN BERNARDINO, CAL.—The construction of the new power plant at Yellow Pine Mine will be commenced at once. Work in clearing ground of wreckage caused by fire has already been started. Mike Clooman of Utah will be the new mill foreman.

CALEXICO, CAL.—At a meeting of the board of trustees recently, reports were presented by W. G. Cross, of Olmsted & Gillilen, Los Angeles, regarding the gas and electric system contemplated. The plant would not cost over \$165,000. The matter will be taken up at once.

BRAWLEY, CAL.—A committee of three has been appointed to bring matter before No. 8 Water Company and the Oakley Company relative to furnishing electricity for Westmorland from the plant that the water company contemplates putting in on the drop nearest to No. 8 corral.

LOS ANGELES, CAL.—Chief Electrical Engineer Scatteredgood of the Municipal Bureau of Power and Light has

been authorized to lay before the consulting board of engineers the general plans for the power house and equipment for Power Plant No. 2, in San Francisquito Canyon, preliminary work upon which is now in progress.

LOS ANGELES, CAL.—Ralph Bennett, of Los Angeles, has applied for 200 second feet of the waters of Strawberry Creek and 600 second feet of the North Fork, San Jacinto River, also 200 second feet of Indian Creek, Riverside county, all tributary to San Jacinto River, for irrigation and power purposes. The applications provide for the storage of 50,000 acre feet per annum.

PASADENA, CAL.—Definite statement from F. D. Howell, engineer, as to cost of the proposed municipal railway gives the commission confidence that a \$3,000,000 bond issue will be sufficient to purchase right-of-way, build and equip the line for operation. Chairman Hamilton states that the bonds will probably run for 30 years and bear interest at 5 per cent. The election was held on April 3rd.

EL CENTRO, CAL.—The Holton Power Company will install a new substation at Brawley, improved equipment at Holtville, and a new line between El Centro and Brawley, which will increase capacity 100%. The new station at Brawley will be of out-door type with steel structure and concrete forms, with a similarly constructed meter house. New regulators to handle the increased volume of power will be placed in the Callexico substation.

THE INTER-MOUNTAIN DISTRICT

PROVO, UTAH.—The Beaver River Power Company has consolidated with the Southern Utah Power Company.

BRECKENRIDGE, COL.—The installation of an electric light plant is under consideration by the city of Breckenridge.

NUCLA, COL.—The installation of an electric light plant in Nucla is under consideration. Lincoln Vestal is interested.

CRAIG, COL.—Work will begin on the construction of the proposed new electric light plant as soon as the frost is out of the ground. Mr. Dutcher will have charge of the work.

WALLACE, IDA.—The power plant of the Federal Mining and Smelting Company near upper Burke was burned, entailing a loss estimated at \$20,000. This plant had been used as an auxiliary.

MISSOULA, MONT.—Engineers have been engaged by the Missoula Light & Water Company for the purpose of having plans perfected for sluice gates at the company dam near Bonner, estimated cost being \$50,000.

RONAN, MONT.—Stephen Walner of Butte is considering the establishment of a light and power plant here. Two years ago the citizens voted to grant a franchise, but the parties could not secure the needed equipment.

CUT BANK, MONT.—John Seal & Son have been granted a franchise to construct and operate an electric light plant in Cut Bank for a period of twenty-five years. It is expected to have at least one of the units in operation within sixty or ninety days.

PHOENIX, ARIZ.—The Superior Light & Power Company, having the same organization as the Superior Water Company, has been granted a certificate by the Corporation Commission to establish a power plant to supply electricity. Construction is to begin at once.

SEDGWICK, COL.—Plans are being prepared by the Henningson Engineering Company, National Bank Building, Omaha, Neb., for the construction of an electric light plant and waterworks in Sedgwick. An election will soon be called to vote on an issue of \$30,000 in bonds for same.



VOYAGES home need to be paid for

—Victory Loan

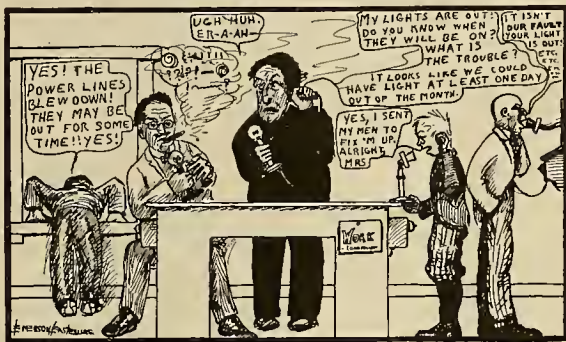
THE VACUUM CLEANER

THE VACUUM CLEANER

CONVENTION PAPERS are important, of course, but who would miss the personal give and take of the smoking car and that mysterious back room (361 was the code at Riverside, wasn't it)? It is to preserve the conversational humanity of complete living that this page of the Journal of Electricity is regularly reserved and turned over to the office vacuum cleaner for the display of such bits as are collected in the daily round of the editorial rooms.—The Editor.



A picture of a central station twenty seconds after the transmission lines went down—as witnessed by our secret agent. Emerson Esterling, electrical man of Ashland, Oregon, is the artist of this gem.



Gas attacks are not confined to the war zone. Here are a few extracts—or whiffs—from a recent one directed to the recent gathering of the Pacific Coast Gas Association by the vice-president and manager of the Pacific Gas & Electric Company:

To the Members of the
Pacific Coast Gas Association
Assembled in solemn conclave
over the remains of hot birds
and cold water in Los Angeles — Greetings!

I sincerely regret that important engagements detaining me in the bucolic precincts of San Francisco, prevent a visit to the greater metropolis in the South; greater only, however, in its territorial confines.

It is a source of some satisfaction to me to know that among the natural gases in the Cafeteria of California, artificial gasers may meet around the same table and congratulate each other upon the fact that good old gas is still King.

There were days when it was doubtful whether gas could hold up its head and continue to assume its physical proportions in the face of the onslaughts made upon it by that weird creation of nature called electricity, which is much like the wind—"no man knoweth whither it cometh, or whither it goeth," and it is generally agreed that the windy aspirations of forced breath of the advocates of electricity are on all fours with the juice itself. My congratulations to the workers in the vineyard of gas, that have gathered its crops yearly without cessation, but not without effort. My advice is to stand by the guns and generate your retorts so that they will not need purification. But let us work in harmony without younger brother, electricity, and show him the way from time to time.

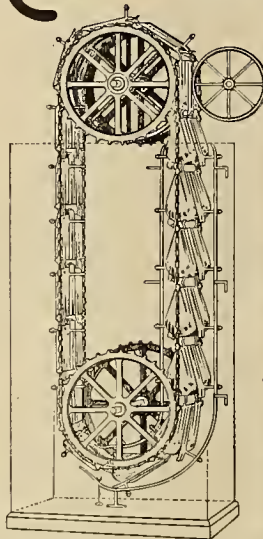
Gas as you may tonight, always remember that before you were it was, and will be, for nothing can change the eternal progress of that which lighted the way from wick to wicked.

Sincerely yours,

JOHN A. BRITTON.

Not exactly perpetual motion but something almost as good is promised by this little advertisement. Note that one drop of water every five minutes, a pint of water a day, will furnish plenty of power to light, heat and cook in a dwelling house of six or

YOUR FUEL QUESTION SETTLED FOR ALL TIME BY A GREAT INVENTION



**One Drop of Water
Every Five Minutes—
a Pint of Water a Day**
will furnish plenty of Power to
LIGHT, HEAT AND COOK
in a common dwelling house of
six or seven rooms.

Cost of Installation, about \$250;
Cost of Operation not to exceed
50 cents per year.

Will last for many, many years.

A Very Simple Mechanism When Once Understood

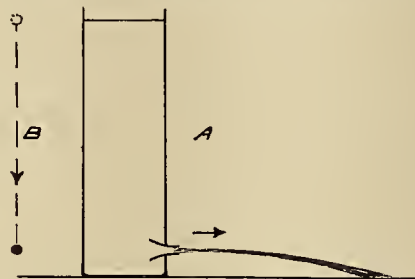
For further information call on Rufus Ames
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The illustration at the left represents one unit.
Any number of units can be added, and improved,
to obtain the results required.

seven rooms. For all these virtues the owner pays not more than 50 cents a year. The fortunes to be made in this world-beating device will probably go far toward recouping the losses of the central stations who must undoubtedly go out of business with such disastrous competition.

ENGINEERS OF YESTERDAY—7. TORRICELLI

(A Series Compiled by A. L. Jordan)



How does the speed of the jet of water (A) compare with that of the ball (B) if the latter falls from a point on a level with the water surface?

According to Torricelli's law they are the same, and about equal to eight times the square root of the height (in feet). Torricelli devised the scheme for measuring the "resistance of a vacuum" by a column of quicksilver and thus invented the mercury barometer (1643), the space at the top of which being still called the "Torricellian vacuum." He also investigated the mathematical relations of the curve called a cycloid and was the pupil of Galileo, as well as a real friend, who soothed and comforted the blind scientist in his last years.

THE VACUUM CLEANER

THE VACUUM CLEANER

IN THIS ISSUE: New Advances in Street Illumination

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JOURNAL OF ELECTRICITY

VOL. 42 NO. 9

SAN FRANCISCO, ^{May 1} MARCH 1, 1919

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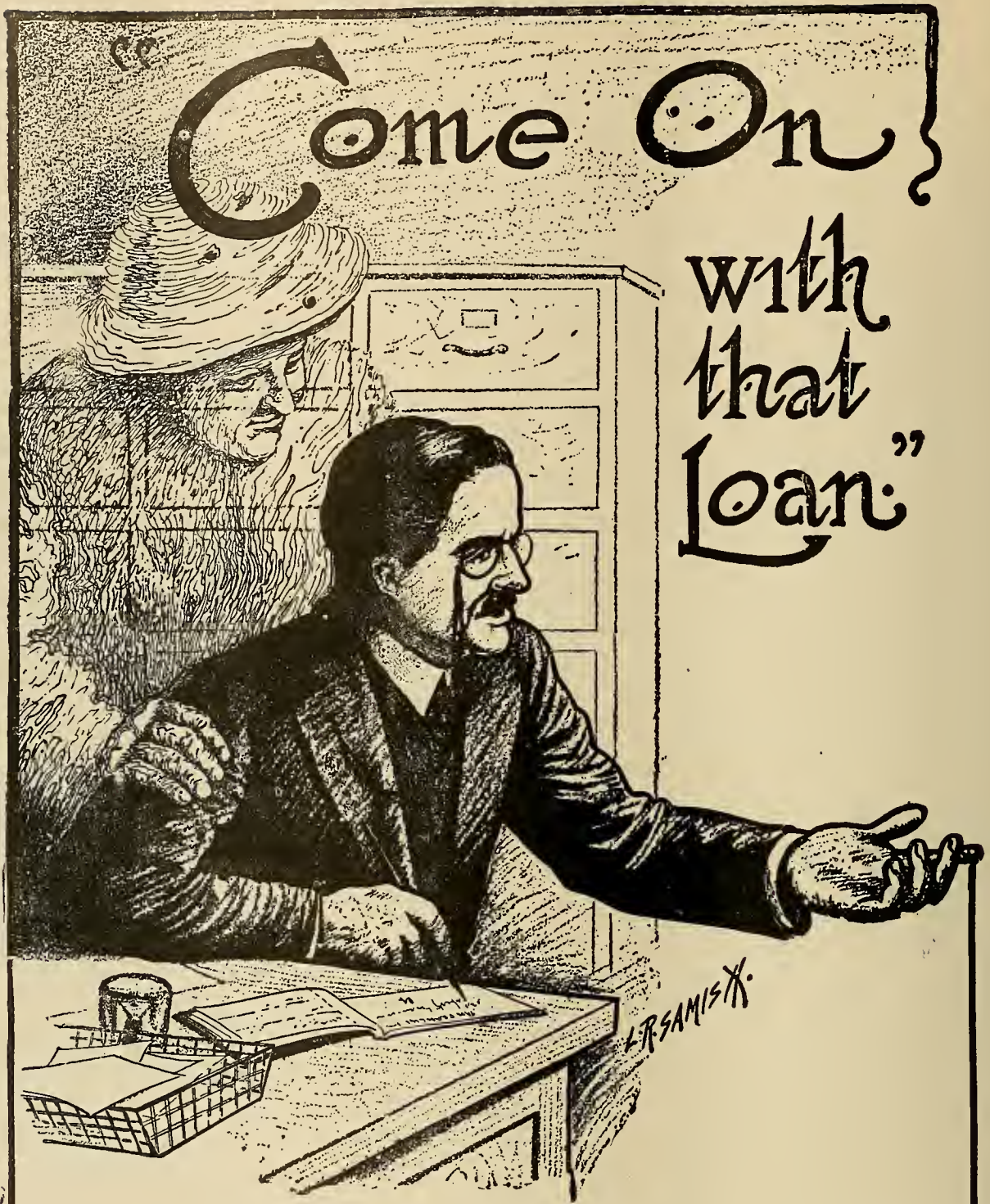
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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

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VOLUME 42

SAN FRANCISCO, MAY 1, 1919

NUMBER 9

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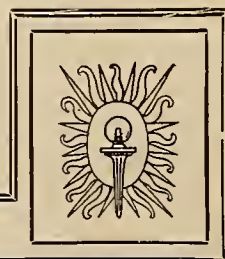
ARTHUR H. HALLORAN
ASSISTANT BUSINESS MANAGER



A NEW RECORD IN ARC ILLUMINATION — A perpetuation of the beautiful and effective illumination advances recorded at the Panama-Pacific International Exposition has been achieved in San Francisco's business section, known as the Triangle Lighting District. Taken as a whole the Path of Gold and the Triangle Lighting District in this city of the West unquestionably establish new records in the use of the arc lamp in intensive white way or high power work whose quality, life and sparkle, contrast with the window and sign lights, higher efficiency and relatively low maintenance cost come in for consideration.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, MAY 1, 1919

Number 9

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The Highest Honor any organization can confer upon one of its members is the election to exalted office in that organization. And in the election to such office the real honor consists in the fact that recognition is thus given of the confidence held in that member by the membership at large that he is worthy of greater and wider opportunity for service. At this season of the year engineering societies, industrial organizations and other activities for betterment of the industry throughout the West are engaged in choosing leaders for the coming year. Hence in choosing men for leadership the ideal of greater opportunity for service should be borne in mind. Such a type of man, when chosen, will devote the time and energy necessary for the obligations demanded in the fulfilling of the confidence reposed by the election to office.

Ever since the dazzling beauty of the Panama-Pacific International Exposition set new standards of illumination that not only proved of tantalizing beauty but of increased usefulness in turning night time into day time, the business world has watched with increasing interest each new development in the matter of scientific illumination.

The Triangle Lighting District

The first great practical result of the lighting effects of the Panama-Pacific International Exposition came about in the use of projectors for the industrial activities of the nation during the trying period of the war. Side by side with this phase of development has gone the matter of effective street illumination. In San Francisco the Down Town Association, an organization composed of the best known business men in this city, has devoted unusual study to the question. The result has been the establishment of new advances in street illumination. On other pages of this issue interesting accounts are given of these new advances by one of the engineers engaged in the work and a second article by Mr. Fennimore, past president of the Down Town Association and chairman of the Lighting Committee that undertook the new work recorded in these articles just referred to. Mr. Fennimore's discussion represents the business man's viewpoint and adds an interesting angle to the consideration of the subject.

The Path of Gold on Market street and the Triangle Lighting installation in the same neighborhood constitute systems of illumination of which the West may well be proud. While it is true that statistics just made public by the Census Bureau at Washington show that arc lamps as a class decreased in number from 348,643 in 1912 to 256,838 in 1917, and that incandescent lamps increased from 681,957 in 1912 to 1,389,382 in 1917, this fact in itself does not in any manner condemn the arc lamp for street lighting

in those fields of usefulness where it has demonstrated its unquestioned superiority.

In passing down Market street to the Ferry Building during the evening hours it must be admitted that for intensive white way or high power work this installation has distinct advantages of quality, life and sparkle, contrast with the window and sign lights, higher efficiency and relatively low maintenance cost.

In summing up these new advances in street illumination it is safe to say that once again the West may take a sense of pride in saying that within its confines have been established new records that not only add distinct contributions to effective illumination, but from an æsthetic point of view, during the day as well as the night, the city beautiful has been passed up to higher standards of attainment.

Practically every organization devoted to public betterment is devoting some attention to the "Own Your Home" campaign. In the Northwest the movement has taken hold with especial emphasis. Contractor-dealer associations in this district are forwarding the movement by cooperating with local organizations of many other branches of industry.

In British Columbia, the British Columbia Electric Railway Company is actually supplying a fund of money to aid its employes in the building or acquiring of homes in the present scarcity.

Mr. George Kidd, general manager of the company, has placed \$50,000 at the disposal of the British Columbia Electric Office Employees' Association to be loaned at 6 per cent over a term of twelve years. The scheme is believed to be one of the first of its kind to be launched in this province, if not in the whole of Canada, and it is already being gladly accepted by the company's employes.

The Own Your Home Campaign

The proposal will have a tendency to relieve employes of the company from the pressure of high rents, give them homes of their own and thereby induce thrift and interest in their community. Due to the present scarcity of homes many of them have been inconvenienced by having the homes they rent sold over their heads. Many others feel that paying out rent year after year without a permanent interest in their home is not desirable.

Some of the company employes already possessed lots but had not the wherewithal to build on them unless at high rates of interest, when the monthly charge for principal and interest would be much heavier than rent. The disposal of the fund has been placed in the hands of a joint committee composed of representatives of the office employes' association and the management of the company and the \$50,000 has already been allotted by the committee.

The whole idea of starting building operations throughout the West is timely and healthy and should receive encouragement from all quarters.

The Imperial Valley has of late come into the limelight due to certain discussions in the halls of Congress relative to the purchase of Lower California from Mexico. As previously discussed in the editorial columns of the Journal of Electricity, the control of the Colorado River to its mouth at the Gulf of California is the one thing that interests the West more than any other factor at this time. This interest does not center so much in the question of where ownership really should be vested as it does in a discussion as to how best jurisdiction may be brought about that will secure safe and economic use of the waters of the Colorado River, so necessary to the irrigation of a very broad expanse of arid land in this section of the West.

An instance of how necessary is this control will quite forcefully come to mind when we recall the Salton Sea disaster some years back, which came nearly destroying for permanent use thousands of acres of fertile lands. This situation came about due to the fact that the artificial lake that was being formed lay below the level of the Colorado River, due to the vast silt deposits that have raised the channel of the river in years past.

And this silt carrying capacity of these waters today presents a unique problem in this district. The Imperial Irrigation District composed of some 600,000 acres is supplied by a main canal from the Colorado River. This main canal carries over 200,000 cubic yards of silt per month. Hence it is readily seen that the consequent choking of the canal and laterals becomes a problem difficult of solution.

Electricity has entered into the solution of this problem in an interesting manner. The power lines of the Southern Sierras Power Company, which by the way constitute the longest transmission of hydroelectric energy in the world and at this point receives its energy from Bishop Creek, 450 miles dis-

tant, pass within a few hundred yards of the international boundary line, on the California side, where the company is installing a substation at the Hanlon heading. Here dredges are being employed, electrically operated, to scoop out the silt and keep the canals free from interference of this sort.

Electrical energy has been furnished from a temporary substation for several months, and two new dredges, each with a total connected load of 850 h.p., have been installed. The irrigation district is changing over a third dredge from steam to electric drive and will within a short time put a fourth one into operation which will increase the total connected dredge load to 2750 h.p.

Electricity in dredge operation is not new to the West. For some years past the West has led the world in the electrical operation of gold dredges. One of these giant iron clad monsters, for instance, near Marysville, California, known as Marysville No. 5, has a record of digging, washing, extracting the gold and stacking the washed gravel, at the rate of 4,599,518 cubic yards per year, at an average cost of about three cents per yard.

The problem of silt deposits in the Imperial Valley canals is one that still is far from solution, but it is believed that electrical energy in its many possible applications will prove the saving factor.

The increasing use of the electric sign since the beginning of the armistice is one of the happiest indications of the quick return of normal business conditions throughout the West. The extent to which many of the smaller communities are taking advantage of the method electrical is best instanced by consideration of one of the enterprising cities of the Northwest.

North Yakima, Washington, with a population of 14,000 people in accordance with the last census, possesses one hundred and thirty-three electric signs, which is a very high per capita average. The Pacific Power & Light Company, the progressive lighting company of North Yakima, has long regarded the electric sign as an important element in its load and has taken special means to develop the electric sign through cooperative solicitation with one of the local representatives of a well known sign company. The signs in North Yakima are of an exceptionally high grade and the lighting company maintains a maintenance and patrol service to relieve the merchants of all details in connection with the care of their signs. One electric sign on an average to every 105 persons in a city of this size is an unusual record and it is claimed that North Yakima illustrates the greatest per capita average use of electric signs in the state of Washington.

It is hoped that the recital of this typical instance from the Northwest may serve to quicken the pulse of the electric sign activity in other communities, as the possibilities of this type of electric load are most encouraging from every viewpoint.

Electric Dredges in Irrigation Canals

Renewed Activity for the Electric Sign

The electrical industry can do much to help clarify the disabled soldier situation. While it is gratifying to note that of all the maimed and wounded American soldiers the actual number of totally blind does not exceed 100 in all and that the mutilated and amputated does not exceed six per cent of the whole, yet it has developed that forty per cent have contracted tuberculosis in some form or other. By care and proper employment a large percentage of this latter class can soon hope to enter again the activities of the business world.

The government, through the Federal Board of Vocational Education, has this entire matter well in hand and the out-of-door industries of the West are being called upon to help in placing many of these men after their health and training is such that they can be recommended for special service. The need is a worthy one and the call upon the electrical industry to bear its share of the burden will be answered, for it will be considered a privilege by all to do everything reasonably possible to assist in this work.

Much criticism has from time to time drifted in from foreign shores relative to the manner in which American packages for foreign shipment have been received in ports of the Pacific. Excuse was given that due to the inexperience of American shippers in foreign trade, this condition of affairs had arisen, but that undoubtedly later months would develop the fact that American enterprise would overcome this difficulty in the same excellent manner that it had at home. It now develops, however, that at home our shippers have much to learn in the art of packing for the home market. Those who have visited foreign countries, notably Japan, become greatly impressed with the tidy, neat and secure manner in which their ware is packed for shipment. Perhaps California fruit shippers, too, are on the whole to be commended for the manner of excellency in shipment. But in the electrical industry as a whole much is still to be learned regarding this very important subject. Those shipments passing through the parcel post and the express companies should especially be packed with unusual care. Recourse to the statistics of breakage on file in damage suits too often proves the carelessness of the shipper and surely the electrical industry, so widely known for efficiency and down-to-the-minute ideals in effective accomplishment, will not longer be found wanting in this regard.

With the satisfaction which comes on paying the last installment of an old debt, with gratitude that the war was not longer and the sacrifice asked of us no greater, with the comfortable knowledge of a good investment — Come on, boys, let's oversubscribe the Loan!

Many hydroelectric engineers of the West, especially those among the younger class who went to France with the American Expeditionary Forces, have often remarked concerning the possibility of their having a substantial part in rehabilitating France and in assisting in her hydroelectric development.

It now is found that at present there is 4,500,000 to 6,000,000 undeveloped horsepower in France—about the same potentialities as the commonwealth of California. While undoubtedly our assistance in its development will be welcomed, we can teach the French practically nothing in the technicality of the hydraulic art and the construction of factories. There is, however, one important matter in which they can well learn from experience in the West and that is the question of vast developments on a large scale with high voltages and interconnected systems.

The important question of standardization, especially in matters of frequency and voltages, has been developed far greater in the West than elsewhere in the world, under interconnection and inter-operated systems prevailing in the West. The matter of merchandising standards, too, is far more advanced. In France it is reported that the smaller manufacturer who makes a lamp socket, for example, or the retailer who sells the lamp socket, will call on the manufacturer to make his a little different from the other kind, on the theory that having obtained his original customers he can hold them as they cannot get that particular type anywhere else. The very effective work of the California Electrical Co-operative Campaign has long since made possible the merchandising of electrical ware to the individual profit of all engaged without the employment of such subterfuges.

And in the matter of engineering advance in quest of the latest ideas in design and automatic operation of power plants one only has to consult the pages of our last issue to note how this section of the nation has outdistanced all other districts in the world in this regard.

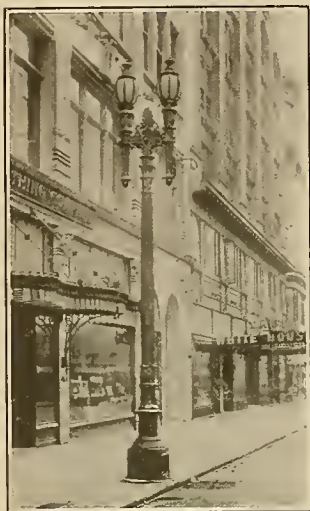
THE NEW JOURNAL SERVICE: It is with no small feeling of appreciation that the Journal of Electricity thanks its friends for the very cordial support that has been given to the series of articles on the Business Library by Miss Krause, Librarian of the H. M. Byllesby & Company, and the course on Elementary Electricity by Professor H. H. Bliss of the Extension division of the University of California, both of which series are now appearing in the Journal of Electricity. From practically every quarter of the nation have come letters of commendation and support for the Business Library series, while from every quarter of the West a genuine interest is being shown in the electrical course. Power companies, jobbers, manufacturers and telephone men have all shown a splendid spirit of cooperation. There are now in course of preparation articles on accounting and cost keeping which should round out the problems of the contractor-dealer in a helpful manner not hitherto attempted in American technical journalism, announcement of which will be made later. The full discussions of the papers presented at the Coronado conventions will appear in the next issue of the Journal of Electricity.

Lighting of San Francisco's Triangle District

BY A. F. DICKERSON

(That the arc light still holds its own in the field of street lighting is testified to by the success of the recently installed triangle lighting system of San Francisco. The pleasing and adequate nature of the resulting illumination has already led to its serving as a model for the street lighting of several other large cities. The author is connected with the Illuminating Engineering Laboratories of the General Electric Company.—The Editor.)

San Francisco now rightfully claims the distinction of having the best lighted business district of any city in the world. In early 1916 a movement, fathered by the Downtown Association, was started to perpetuate some feature of the illumination of the Panama-Pacific Exposition. The aid of W. D'A. Ryan, Chief of Illumination of the Exposition and Director of the Illuminating Laboratory of the Gen-



Not only is this a beautiful fixture, but it is designed to give a very bright light which is yet very pleasing. The ultra violet rays in which the arc light is so rich, while adding nothing to the illuminating value, are extremely irritating to the eye. The "San Francisco Golden Cararra" glass used in this fixture entirely cuts off these rays, providing a soft and radiant spread of light.

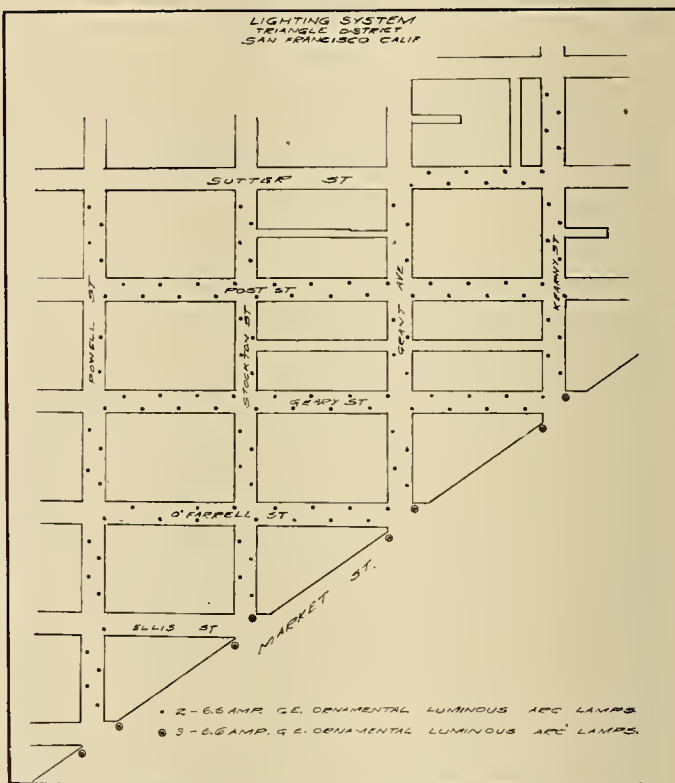
eral Electric Company, was secured and the result was the lighting of Market street, the now famous "Path of Gold," on October 4, 1916.

The success of this lighting led to numerous requests for extensions to include the entire retail district of San Francisco, bounded by Market, Powell and Sutter streets, popularly known as the "Triangle." A standard was designed by J. W. Gosling, of the Illuminating Laboratory, and in a very short time sufficient funds raised to enter into a contract with the Pacific Gas and Electric Company for this lighting. As in the case of Market street, the entire proposition, amounting to about \$85,000, was financed by the above company. Of the total yearly maintenance cost of over \$30,000 the property owners and tenants through the Downtown Association pay approximately \$16,000, the remainder being carried by the city. Work on the installation was commenced in the spring of 1917, but was stopped by the war. Immediately after the signing of the armistice the system was rushed to completion and lighted shortly before the holidays.

The old lighting standards in this district were five-light clusters with four 40-watt lamps in the down-turned globes and two 25-watt lamps in the central globe. All lamps burned all night. As the standard locations were satisfactory, they were retained, the arrangement being staggered, as indicated on the accompanying diagram, with a standard to approximately each 60 feet of street. There are

112 lamps on 56 standards that burn all night and are maintained by the city; the remaining 162 lamps are extinguished at midnight.

The standard is pure Greco-Roman in design, consisting of the base, ornamental fluted column with two volutes and an anthemion growing out of the column. The two volutes act as decorative supports for a cross-arm upon which are placed two ornamental luminous arc lamps, the electrode tubes of which are covered by torches. The weight of the top ornament and arc lamps is carried by a 4-inch diameter supporting pipe core embedded in a concrete foundation. The standard weighs slightly over



A district adequately lighted as is this one is a permanent asset to a city. How much it means to the merchants in trade, fire protection and freedom from burglaries is shown by the fact that the Down Town Association pays one-half the expense of the lighting.

a ton and has a height of 22 feet from the sidewalk to the arcs.

The system was designed to give an illumination equal to that of Market street and the same type of lamp was used, i. e., the General Electric 6.6 amp. ornamental luminous arc with eight-panel ribbed globe equipped with "San Francisco Golden Cararra" glassware. The luminous arc was recommended for San Francisco by Mr. Ryan on account of its high efficiency, low maintenance costs, wonderful quality of white "snappy" light, and its successful operation at the Exposition and in scores of cities throughout this country, due consideration being given to the



"My, how bright!" is not the exclamation elicited by the Triangle District Lighting—that would mean that the effect was glaring. The idea has been to provide an illumination comparable with daylight which secures light, attractive streets without calling attention to its units, except as they fit into a harmonious whole.

possibilities of future developments. This lamp was approved by the lighting committees of the Downtown Association and the city only after a thorough investigation.

Another feature connected with the lighting of this district was the removal of all trolley poles and the fastening of all trolley span wires to eye-bolts in the building facades.

The success of the intensive street lighting of San Francisco can best be summed up in a recent statement by W. D. Fennimore, chairman of the Downtown Association and leading spirit in the campaign for the above lighting: "We have at last solved the problem which will largely contribute to holding and solidifying the retail business district into a permanent location. The solution in one word is — LIGHT."

GOOD LIGHTING AND BUSINESS PROSPERITY

BY W. D. FENNIMORE

(What good lighting means to the merchant in increased business as well as in fire and burglar protection is here told by the chairman of the lighting committee of the San Francisco Down Town Association. As president of the California Optical Company, the author is particularly competent to judge of the freedom from eyestrain, together with a high degree of light intensity which the San Francisco system secures.—The Editor.)

"Commerce follows the Flag" is a trite saying and a true one, and in the same spirit the business districts of large cities follow good street lighting. Every large city in the Union has at some time seen its principal retail district move from the original location, either north, east, south or west, gradually in some cases and in an almost unbelievable short space of time in other instances. One portion of the town is deserted and the new section becomes prosperous and progresses. In the old district property depreciates and rents go down, while in the new section the reverse is the case. Rarely if ever does the old section recover.

In New York, for instance, in the past eight years valuable downtown retail property has become

vacant and greatly depreciated in value while Fifth Avenue and adjacent property in the uptown district has become most valuable and desirable, bonuses being paid for retail store locations.

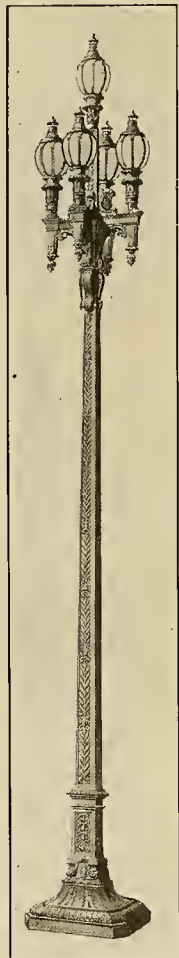
What causes this migration of business houses from the old business district, which is nearly always convenient from point of distance and transportation facilities? How can such costly migration be reduced to a minimum, if not actually prevented?

Answering the first question, the principal reason is that property owners seem to be satisfied to enjoy an income without safeguarding its future—they allow their buildings to become old, making few if any improvements, and consequently the property "runs down" and becomes obsolete. Along comes some live, enterprising real estate holder and offers to put up modern buildings for commercial purposes at fair progressive rentals, and thus induces a few leading houses by these attractive offers to make the change. The ball starts rolling and other houses follow in order to be in the neighborhood of the large and extensive establishments. And then, "like a lot of rats from a sinking ship," the grand tableau of desertion is staged for new fields and new locations, and "the devil take the hindmost."

The natural trend of retail district locations is along the lines of the level land; in San Francisco there is but a limited amount which is not now occupied by the better class retail stores. These establishments should and can be held where they are if the property owners are enterprising and co-operate with their tenants—they should not hesitate tearing down the old structures if necessary and replacing them with modern ones—at any rate in keeping the property in splendid repair and attractive. The property owners should not lose sight of the fact that after all is said and done the merchant makes the street and not the street the merchant.

But it has remained for the far-sightedness of the Down Town Association after months and months of preparation and effort to materialize the solution to the problem which will largely contribute to "holding" and "solidifying" the retail district into

a permanent location. The solution in one word is—Light. After the completion of the famous "Path of Gold" on Market street the problem of extending the same type of lighting to the "Triangle District" bounded by Powell, Bush and Market streets, was undertaken and the month of December of last year showed the answer of three years' work of the Down Town Association through its Lighting Committee, who conceived the idea of installing modern, up-to-date street lighting which was so effectively demonstrated at the Panama-Pacific World's Exposition. It has been proven again and again as one of the greatest factors in holding business in a given district and that the crowds always shop in the daytime where the district is well lighted at night; that transients in a city are attracted to the well-lighted district in the evening and do what might be termed "window shopping," returning and purchasing in the daytime. People unconsciously pick well-lighted streets as natural routs of travel. Well-lighted districts centralize trade just as the wide-awake mer-



Standards used elsewhere in San Francisco. The present "Triangle Lighting System" is an extension of the "Path of Gold" of Market street and utilizes standards with the same basic elements of design.

chant draws attention to his merchandise by scientifically lighted and artistically decorated window displays which have a "pulling" power hard to resist.

The completion of the Triangle District Lighting System marks the claim of San Francisco as being the best lighted city in the entire world.

The Engineering Feature

Science has played a great part in the new forms of illumination in this district. After the preliminary work of removing the old trolley poles and attaching the guy and span wires by means of eye-bolts to buildings, thus clearing a great deal of unsightly erections from the streets, the erection of standards was undertaken.

In the Triangle District there are 114 lights which burn all night and 164 which burn until midnight, or 278 in all. The total cost per annum is approximately \$32,000, of which amount the property owners and merchants, through the Down Town Association, pay half. The total payment by the Down Town Association on the Market and Triangle Districts exceeds the sum of thirty thousand dollars, the city paying an equal amount.

The standards are so arranged that the light is uniformly distributed, throwing no shadows on the streets and abundantly lighting the facades of the buildings. The globes are made of an amber glass known as "San Francisco Golden Carrarra" glass. It was developed especially for this system, its great virtue being in the fact that while affording abundant illumination it cuts off the ultra-violet ray and brilliant red (heat) rays, which in the ordinary electric lights are so irritating to the eyes. The system, unlike many other bright illuminatory systems, is not injurious to the eyes, and the absence of the flaming, piercing, eye-straining arc so common in unscientific illumination, makes it the highest class of street lighting in existence. It is predicted that all improvements in street lighting in the future for years to come will be along the lines of the present system.

While the lamps are of a golden amber hue by day yet the light by night is a soft platinum-white color. Its chief virtue is its natural unconscious illumination. Just as we walk along in the daytime and say, "What a beautiful day it is," without commenting on the degree of light available, so the illumination at night is so natural that it does not impress us as bright.

FIVE REASONS FOR GOOD STREET LIGHTING

Bright streets mean crowded streets.

Daytime shopping follows night time illumination.

Adequate light means freedom from burglars.

Every passer-by is a watchman—fires are prevented from gaining headway.

A well lighted city makes residents of tourists.

The Man In the Street

BY S. M. KENNEDY

(The Man in the Street—the voter and the customer, is not merely incidental to the electrical business—his good will is essential to it. It is only by giving him a good impression of your business as a citizen of his community, educating him as to the conditions under which you operate, dealing with him as a friendly human being, giving him good service as a customer and finally taking him into partnership, that the electrical industry can be maintained. The author of this business code of success is well known as general agent for the Southern California Edison Company. This paper is to be read before the Commercial Section meeting of the Pacific Coast Section, N. E. L. A., Coronado, May 1, 1919.—The Editor.)

If there is any class of business which is at all times on trial before the great court of Public Opinion it is that of the Public Utility Corporation. The establishments of the merchant, the manufacturer and other industries are operated from eight to ten hours daily—on working days only—but the Central Station Company must be ready to supply instant service day and night, week-days and Sundays, feast days and fast days, high days and holidays. The jury is in constant session taking cognizance of the evidence which is being given, and be the testimony good or bad, honest or dishonest, worthy or unworthy, no item is overlooked when the time arrives to review, sum up and render a verdict. The Utility Company cannot select its jurors as they are selected by the opposing attorneys in a trial in court. Its jurors are selected by the destiny that groups men together in cities and communities. These jurors may not be challenged, but must be accepted with all the bias or prejudice they may bring to the trial. Consequently it may be the part of wisdom for the heads of Public Utility organizations to study the jurors—to analyze and diagnose any causes for suspicion, prejudice and opposition to the end that the evidence may be so influenced and directed by liberal policies and enlightened management that the verdict may be a source of every day satisfaction. Certain conditions surrounding the operation of a Public Utility's business are fixed and cannot be altered, and such being the case, operation should be so adjusted that these conditions may be recognized, and, if possible, used to advantage. It is as much advisable for a corporation to be philosophical when dealing with the inevitable, as it is for the individual—both may well agree with James Whitcomb Riley:

"It ain't no use to grumble and complain,
It's just as cheap and easy to rejoice;
When God sorts out the weather and sends rains,
Why—rain's my choice!"

It is probably safe to say that three-fourths of the mistakes that the Central Station man makes in his intercourse with the public are made because he does not really know the things he thinks he knows. If the Central Station is constantly on trial had it not better keep its eye on the juror and if possible get his viewpoint? There was a time when it was thought the juror could be ignored—that he had to take what was given him and be quiet,—but now things are different. A Russian proverb says: "Time does not bow to you, you must bow to time." Today it is perhaps better to bow alike to Time and the juror and take them both into consideration. The juror can only be fixed by some one obtaining his viewpoint—that is, by the Corporation man looking

at the business from the outside, or as it is seen by the Man in the Street.

The Man in the Street is a many sided individual in some respects, but in the main he will be found reasonable, tractable and not unfriendly. In my efforts to illustrate the different angles of observation from which the Man in the Street looks inward at your business, I will endeavor to develop five sides of his character. It will be distinctly understood that I am not advising anyone how to change or conduct his business. Long ago I learned it is permissible to express an opinion—but advice should be sent by slow freight. The Man in the Street has some advantages not possessed by the man inside, and the man on the inside can well afford to listen if the man on the outside has anything to say. The five angles from which the Man in the Street will here be considered are (1) The Impressionist, (2) The Student, (3) The Human Being, (4) The Customer and (5) The Investor.

The Impressionist

It has been truly said that trifles make perfection, but perfection is no trifle. As an impressionist, the Man in the Street is either consciously or subconsciously influenced by what appear to be trifles. Daily as he proceeds on his way he observes the properties and employes of the Central Station. Do they impress him favorably or do they irritate him? What pleases him and why? When is he jarred and for what reason? As he looks along the principal streets in his town do the pole lines impress him as being clean-cut and regular? Are the poles located in the least objectionable places and are the services run with any regard to appearance? Sometimes he sees lines that appeal even to a layman as being carefully planned and excellently constructed. Sometimes he observes that a street or highway is needlessly disfigured by irregular poles, ragged wires and sloppy construction. Don't imagine these conditions are not observed by the Man in the Street. They speak for themselves and later on, if they are not remedied or made less objectionable, the Man in the Street is liable to make a noise which will sound to the Central Station like having to spend a lot of money for removal of such lines or maybe the installation of underground construction in their place. How about the Stations, Sub-stations, Warehouses and Garages? Do they always present a creditable appearance? Could the grounds around them be kept more tidy and would some needed repairs or a coat of paint on some buildings make a better impression? The Man in the Street misses nothing. He knows whether you are properly maintaining your property or allowing it to degenerate. If ob-

jectionable conditions continue without improvement he may charitably conclude you are in a rut and he knows that the only difference between a rut and the grave is in its length and breadth.

The Man in the Street has business in your office occasionally. Is it an up-to-date office, with an open, inviting appearance, or is it one of the old, forbidding type, with high railings, with little windows for the clerks to look through at customers and where customers must stand off and meekly take whatever may be handed them? A pleasant, cheerful office is an invitation to come again, and no one realizes it more than the Man in the Street. Are the clerks neatly dressed—the men with clean clothes and clean-shaven faces, and the women in such costumes and colors as befit their work? Is the Manager easily accessible or is he locked in behind a closed door from where he cannot see his assistants and where the company's customers cannot see him? High railings, dark partitions and closed doors impress the Man in the Street as belonging to ways that are dark and secrets that are deep. Open offices invite him to inspect and he is liable to say to himself that an invitation to inspect implies that there is nothing to conceal.

I have heard some men say, "What does it matter to the Man in the Street how we maintain our property? We get no more revenue from him if our lines are straight or crooked, our buildings and property tidy or dirty and our offices inviting or the reverse! He gets the service just the same." There is the great mistake. You are part of the community in which he lives and takes a pride. Your methods either help the community or hurt it. If your methods please him, he will ultimately take more liberally of your service, and your income will be correspondingly greater. The Impressionist side of The Man in the Street is one that should be regarded as highly important and not to be slightly ignored or carelessly overlooked.

The Student

The one thing that is most frequently overlooked in connection with the Central Station business is that the company is distributing an intangible commodity. The purchaser does not see what he is buying, as is the case with ordinary merchandise. He cannot tell when he pays his bill that he is paying only for what he has received. His senses, which are useful in buying some things, do not help him in his purchases of electricity. Under conditions like these, something must be relied upon to take the place of the senses and the only substitute is confidence. Now the average Man in the Street wants to know just where he is at when spending his money, and the Central Station Company should make it easy for him to learn all that is possible concerning the real facts surrounding the production and distribution of electricity. The Man in the Street will study conditions and reach his own conclusions about your business. If the truth is spread before him for thoughtful inspection, his conclusions are liable to be favorable. If, however, he becomes saturated with mis-information concerning the methods and aims of the Central Station, then his ideas

will be perverted and his attitude prejudiced. The Man in the Street is reasonable and willing that a company giving a good service should receive a fair return on its investment. However, in a reasonable manner he must be shown what is the investment and what constitutes a fair return thereon.

Perhaps there is nothing more important for the Man in the Street to study than the subject of what is good service and how it may be obtained. If he is a lighting consumer he ought to be informed as to the difference between ordinary light and scientific illumination. He should be advised that he may often have better lighting at less cost, by using more modern methods. If he is a power consumer his installation should be inspected and where conditions indicate wasteful consumption, the way should be pointed toward more economical operation. He should be instructed that when he has troubles with his service he should tell them to the Company and not to his neighbor. He should know what department of the Company to communicate with and what is the telephone number.

Does the Man in the Street know that all rates for service are subject to approval by the State Public Utility Commission? Does he know that these rates are ordered or approved only after exhaustive investigations made by the Commission's experts as to the company's actual investment, operating expenses, and depreciation charges and are calculated to yield only a small return on the capital invested? Does he know that the Central Station Company cannot raise a rate or increase a charge without an order from the Utility Commission after a public hearing has been held? Does he know that in fixing rates the Utility Commission does not consider the company's bonded indebtedness or outstanding capital stock as a basis for calculating what should be the company's net earnings? Does he know that the Central Station Company cannot issue any securities without the approval of the Utility Commission, and that the Company must show how every dollar derived from the sale of securities is to be spent? Does he know that the return the Company is allowed to earn on its investment is not sufficient to provide for extensions and betterments, and that for such purposes new money must come from the sale of the Company's securities to investors? Does the Man in the Street know that if he has a grievance against the Company he may make a complaint to the Utility Commission, and his trouble will be thoroughly investigated? These are matters for the Man in the Street to study. At times they mystify and bother him, but the more he learns regarding public regulation, the more he is liable to esteem the Utility Commission, respect the Company and be satisfied that his individual interests are fully protected. With a proper understanding of Public regulation the Man in the Street has a better grasp of the economic law of natural monopoly. As a student, he may well consider some chapters from the records of disaster that are written in the history of many cities and towns in America where rival utility companies have attempted to operate in the same field, where that field is properly served by one company

at reasonable rates. His study will develop that unfair competitive conditions are ultimately disadvantageous to the consumer, who by increased rates must inevitably pay for the destruction caused by unnecessary competition. All publicity of misinformation should be counteracted by even greater publicity of true conditions. Truth is mighty and if the Man in the Street may study and grasp its meaning he will eventually become a defender of the Central Station and an ardent advocate of its service.

The Human Being

Quite recently the manager of one of the districts operated by a large Utility Company in this state received a letter from a consumer reading as follows:

"Ordinarily when we pay an account promptly, we feel we have fulfilled our obligation, but in your case we are moved to something more, and the purpose of this letter is to thank you for the businesslike manner in which our transactions with your company have been handled. Furthermore, we have enjoyed that indefinable 'something' which goes with your service, and which makes it a pleasure to do business with you."

The Man in the Street is a human being and that indefinable "something" referred to is a recognition of the tactful, attentive courtesy displayed to him as an individual. This attribute attracts new consumers, and makes the older ones feel at ease and satisfied. It is, in fact, the open sesame to the Public good will, without which no company can continue to be successfully operated. The rulings and orders of Utility Commissions may govern the quality, manufacture and distribution of a commodity, but they do not stipulate what shall be the attitude to the individual consumer. That is left to the management.

The Man in the Street dislikes to be herded—he hates to be known as one of so many thousand consumers a company may have in a community. He likes to be considered as an individual and if he is known by his name, he likes it better still.

From my own residence I have occasion to send quite a few long distance messages over the telephone. There are two Long Distance Companies, and heretofore I have always been prejudiced in favor of the older company. When I ask for Long Distance, the routine is, "Number, please? Your own number? Your name?" Recently, at certain hours of the day, a new operator is on my line at the office of the other company. I have never seen her and do not know her name. When she says, "Number, please?" I may say 10621. When she says, "Your own number?" I say 571-W, and then instead of saying "Name, please?" she says, "Oh, yes, Mr. Kennedy." Now, I am the Man in the Street. I like my individuality recognized, and because of that girl's tact, my business seems to be gravitating to her company.

Much of the criticism directed against Utility Companies might be dispelled or relieved by a broad-minded policy in handling complaints, in which each case is treated as an opportunity for acquaintance with the Consumer and each complaint is given an individuality, by impartial and critical investigation. A complaint is an opportunity to make a friend, and the opportunity is with the individual in

particular and not with the class of complaint in general. To satisfy means to hold business that probably was difficult and costly to get. To satisfy means the keeping of old friends and the making of new ones—and friends build up a business. In handling complaints, words are only one means of expression and manner is quite as important; a kindly and courteous manner is not only the sign and mark of a self-respecting man, but it is to words what oil is to machinery in making them move effectively to their purpose. The Man in the Street gives many opportunities for Utility Company employees to know him and please him. Perhaps no opportunity occurs more frequently than in the payment of bills. He probably calls at your office for this purpose once a month. If he makes such a call, pays his money and has his receipt handed him without word or recognition from the employee, he misses something and an opportunity for the company has been lost. If the next time he calls the clerk says "Thanks" when handing the receipt he feels a slight recognition of his existence. If on a third call the clerk says "Thank you" he feels more interested and if on the fourth call to pay money there should be a clerk with tact enough to see the name on the bill, and when returning the receipt to say "Thank you, Mr. Jones," the Man in the Street goes out with an appreciative smile, and the thought in his mind that he is known as a consumer and recognized as an individual. Too much importance cannot be placed upon the treatment of the Man in the Street as an individual who appreciates all the niceties in the relations of one human being to another, and above all he appreciates—

"How sweet and gracious, even in common speech,
Is that fine sense which men call Courtesy!
Wholesome as air and genial as the light,
Welcome in every clime as breath of flowers,
It transmutes aliens into trusting friends,
And gives its owner passport round the globe."

The Customer

Some years ago in a certain Western city where there were three electric companies competing for business, a new theatre was in course of construction. The three companies had identical rates for serving so that element did not enter into the competitive conditions. Mr X, the business manager of Company "A", was watching the situation closely, and became somewhat discouraged when the report was brought to him that the owner of the new building was a stockholder in Company "B" and naturally would influence the lessee to sign with Company "B". Another report he received was that there existed a racial affiliation between one of the directors of company "C" and the lessee of the theatre, and that Company "C" was sure to get the business. The lessee lived in a city several hundred miles distant. One evening as the manager of company "A" was about to close his desk, the office door opened and a stranger walked in. He asked the manager if he were Mr. X, and receiving a reply in the affirmative, he stated he was the lessee of the new People's Theater and wished to arrange for service. He explained to Manager X that there had been much influence used to swing his business elsewhere, but that men

in the theatrical business had a way of inquiring from each other about certain matters. He had inquired from other theater managers as to which company gave the best service, and manager X was informed that not only the theater men receiving service from his company, but others in the city all agreed that company "A" gave the finest service, and looked after its customers in the most satisfactory manner. The Man in the Street listens, inquires and uses his own judgment when he is going to give his business, and your record for attention to the little things in service may often win you big revenue producing contracts.

A Central Station plant ought to be loaded twenty-four hours daily. It does not have to sleep. The load curve ought to be a straight line, before the electrical consumption of any community has reached the saturation point. New consumers are desirable, but the development of increased business with existing customers is still more desirable. For greater business from present investment we must cultivate the Man in the Street. It may be considered an axiom that no consumer is using as much as he could take to his own advantage, and the most profitable business is produced by inducing consumers to increase the number of uses of electricity. Much time and money have been spent in the past in an endeavor to clip a small percentage from the cost of manufacturing and delivering a kilowatt hour. Economies of operation are to be commended, but the time has passed when it is simply a question of jumping a set of service wires to the consumer's premises, and dumping a few kilowatt hours there each month. The time has come when it is up to us to interest ourselves more than ever before in the manner and method of using our product on the consumer's premises, so that the greatest possible economies and benefits may be secured.

The Man in the Street knows of no saturation point, neither should we. The Man in the Street is willing that the annual consumption per capita should increase year by year if he is benefitted thereby. It is up to us to show him that electricity and convenience are synonymous and in what direction new benefits may be obtained. There is no limit to intensive development of this kind—but it cannot be obtained by wishing and waiting. The point upon which this whole question of business development hangs is the ability to let the people know—in other words, to create the desire. The Man in the Street must be informed so that he may be fully advised as to the possibilities of electric service, in the lightening of labor and in adding comfort and good cheer to the life of mankind. He is already in a receptive condition and is only waiting to be shown the wonderful capacity of electric energy in performing almost everything within the range of industrial and commercial life. All we need is men who have a thorough practical and intimate knowledge of the possibilities in the use of electric service. The possession of this knowledge fills them with confidence and enthusiasm, so that when they talk to the Man in the Street, the battle is as good as won. Obstacles are swept aside, objections are over-ruled,

competitions are annihilated and, by-and-by, the Man in the Street, far from being saturated, will, like Oliver Twist, only ask for more.

The Investor

The problem as to the future of Public Utility Companies is one which occupies considerable attention in the public mind today, and is one which is of vital importance to the Utility Company and the public. There is a competition going on between Public control and private ownership. Public control is attractive to many but even its friends acknowledge that because of certain inherent conditions it must travel a long way before it reaches success. Private ownership has pioneered, nursed and developed the business, and the same qualifications which have produced so much good work in the past should enable it to continue and progress in the future. There is a greater need for cooperation between the Utility Company and the Consumer than ever before. But cooperation is a matter of give as well as take. Sometimes it amounts to doing the other fellow's way when it won't do ours. The Man in the Street is thinking as he never did before—he looks at the Utility Company and believes it is prosperous. Why should he not share in its prosperity? Some wise man has said the best way to conserve private ownership is to increase the number of private owners. Who is brave enough to say that is not the answer to the problem? This is an age of frankness, directness and simplicity. If you really want more stockholders among your customers, you must go after them candidly and openly. Don't tell them the benefit will be theirs only—but that the advantages will be mutual. Not long ago one of the power companies in this State received authority to add a temporary surcharge to its rates. A certain consumer living in the territory supplied went to his neighbor one day and said, "How about this surcharge the power company is collecting? Don't you think we had better look in to it?" The neighbor replied, "No, I have been making inquiries regarding the uncontrollable expenses our company has had to face, and we feel that the surcharge is justified." The other man exclaimed, "What do you mean by 'our company'?" The reply was, "Oh, I'm a stockholder of the Power Company."

What better plan for its own protection and prosperity can a Public Utility Company adopt than by making the Man in the Street a full partner in the organization? If the company is properly managed, if it has made a favorable impression upon the Man in the Street, he is already predisposed in its favor, and it will not be difficult to convince him that in order to make the relationship perfect, he should be a stockholder. His desire to become a stockholder will probably be in direct relation to the treatment he may have received from your company in the past, and if he has been well treated the amount of stock he will take will probably be limited only by his financial capacity.

The conclusion which I have attempted to lead up to in the presentation of this address is that human beings are not like merchandise, nor are they

to be handled like merchandise. Dealing with the Man in the Street is a problem in personality, and it is through the point of contact, wherever it may be: at the counter, over the telephone, through correspondence or when and where service may be rendered, that the favorable impressions are created which ultimately affect the prosperity of the Utility

Company. The physical assets of a Corporation may be of fabulous value and may make a handsome showing an annual report to shareholders, but the value of that intangible asset, the confidence and good will of the Man in the Street, may be, after all, the one great element which produces earning power and gives stability to the property.

Field Work of the Cooperative Campaign

(Here is a sample of the work that is being done by the California Electrical Cooperative Campaign. The following are extracts from the reports sent back to the campaign committee by the various representatives in the field. They represent the success of the work and the practical value of its results to the industry in every part of the state.—The Editor.)

The following extracts from reports of field representatives of the California Electrical Cooperative Campaign speak for themselves of the helpful work being carried out for the good of the industry throughout the state:

Report No. 1

Cooperation with the Central Station —

There is not probably a better example in the state of what close cooperation will do than here in ——. At the time of my first visit Mr. Central Station Man had several complaints about Mr. Dealer's way of doing business, and Mr. Dealer had a number of complaints, not about Mr. C. S. Man personally but about line men interfering with his work, telling customers they were being robbed. This has now been straightened out and 100% co-operation exists between the dealer and the light company.

Mr. Central Station Man constantly refers prospects to the dealer and Mr. Dealer immediately follows them up and reports to Mr. Central Station Man the result. I asked the dealer and the light company manager if there was anything more the other could do to help the game along and each said no, that everything was being done. This liberal attitude of cooperation on the part of the light company is reflected in the general attitude of the dealer toward the merchandising end of his business and in his aggressive way of going after it.

Report No. 2

Removing Difficulties —

When I arrived here I found that considerable feeling existed between Mr. Dealer and Mr. B. of the power company. On going into this matter I found that neither party had any real serious complaint, and that most of the feeling was caused by stories carried by ex-employees. I got Mr. B. and we went over to the Dealer's store. The different points of differences were brought up and thoroughly discussed and satisfactorily settled, so that the past differences have been removed and good feeling now exists. This might have developed into a very serious break if this had not been straightened out at this time. Mr. Dealer seemed to appreciate the work that had been done along this line.

A number of suggestions for window displays and moving displays for the store were given to Mrs. Dealer, and she greatly appreciated them and

said that she would have them immediately carried out.

Report No. 3

Boosting the Association —

I called on Mr. DeBaum, Monrovia, California, to secure his application and check to the Contractor-Dealers' Association. He was the only one in the San Gabriel Valley who had not joined. His application and check were secured and there are now five dealers with seven places of business, all members of the association, while eight months ago there were no members in this section. A meeting of these contractor-dealers will be called within the next few weeks. They are all within twenty-five miles of Los Angeles, so that it will not be advisable to form a local, but will be well for them to have their own meetings occasionally.

Report No. 4

An Outside Comment —

Mr. ——— remarked that just before I had called a prominent insurance man of this city had called on him and in the conversation had asked what in the world was happening to the electrical business. He had noticed increased activity in it and several new stores starting up. When men in other business make comments like this, there certainly must be considerable activity and noticeable improvement.

Report No. 5

Merchandising Suggestions —

This is a hardware store handling a few electrical appliances and supplies. There is no dealer here so I called on him and told of the Campaign and its objects. He has noticed improvement in his electrical business the past year and was interested to hear of our work. Several suggestions for increasing the appliance business and ideas for improved merchandising were offered him and will be carried out. He is friendly with the Central Station and conditions will be improved by having him get more actively into the sale of appliances.

WHAT IS A GOOD AMERICAN?

That part of our population which is of foreign birth or foreign-born parentage purchased War Savings and Thrift Stamps to a greater degree than the rest of our people, according to a recent compilation of statistics from the Treasury Department. What is your record on the Liberty Loan?

Salesmanship in the Credit Department

BY CHARLES E. WIGGIN

(What is the psychology which makes people pay their bills—sells credit, in other words? What is the relation between the credit and sales departments and how can they assist each other? These questions are taken up in brief in the following extracts from a paper which was presented before the Electrical Credit Association of the Pacific Coast at their recent annual meeting. The author is credit manager with Dunham, Carrigan & Hayden.—The Editor.)

Sales and Credit

Neither the sales nor the credit department could exist without the other. Of what use is a credit department if you make no sales, and of what use is your sales department if the money is not forthcoming for sales made?

Business is conducted for gain, or profit. Each sale is presumed to show a profit, but that profit is not really made until the money is in hand. It is your credit department that insures this profit, in fact decides from its knowledge of the financial responsibility of the customer whether the order shall or shall not be accepted; and furthermore, makes it certain that it is a profitable transaction by collecting the money.

Of course, there are exceptions to all rules, and just as some sales are made without salesmen or sales effort, so also are found customers for whom the offices of the credit department are not required; but the great bulk of sales are made only by persuasion on the part of the salesman and the bulk of the accounts receivable made good only by persuasion on the part of the credit department. Note a family trait possessed by both—"persuasion."

Selling Credit

Selling goods and selling credit, if we may use such an expression, are two entirely different processes. In selling goods, we exchange merchandise for something tangible—money.

In selling credit, we sell it for an **intangible** something, consisting of honesty, ability, character and moral worth on the part of the customer. The salesman through his knowledge of his line, his prices and the needs of his customer, inspires a desire on the part of the customer to do business with him and his only thought on seeing this salesman is with regard to what he should buy. If, however, the salesman duns him for a check that was mailed the day before or that he intended to send the next day, Mr. Salesman appears in a dual capacity, the line of thought is broken, and neither one is doing the job he ought to. This is the age of specialization, and salesmen should not be required to perform duties devolving upon the credit department except under circumstances where they might volunteer to do so, knowing that they would lose no prestige with their customer or to straighten out some complication.

Personal Contact

Personal contact is what makes the salesman so valuable a feature in the business world. Through personal contact he becomes aware of his customer's whims and his vagaries, his strong points and his failings. So too should your credit man have per-

sonal contact. Make it a point to call on as many of your customers as possible, know their location, their surroundings, the appearance of their stores, their general standing in the community in which they do business, and thereby be better able to harvest the crop sown by the salesmen.

As most of the business transacted by the credit department is carried on by correspondence, it is very necessary that extreme care be used in the wording of all letters. No one should take offense at a firm but courteous letter, but a tart or flippant remark might lose a responsible customer who had cost your sales department considerable expense and time to get. Have you ever thought how you can smile and say something that would lose the account for you if you put the same thing in a letter in cold print?

Mutual Help

Much valuable information can be gathered by the salesmen for the credit department. A chance remark by a customer might reveal the fact that a large order he was placing was for So-and-So who was giving him lots of business. Your credit man might know this So-and-So was in a bad way financially, and the passing of this chance remark on to your credit man might save both your firm and your customer heavy losses. Orders from new customers should always be accompanied by references or the names of firms with whom the customer is doing business, and any general information obtainable. Your credit department will appreciate action of this kind, and you insure better service to your customer because his order is less liable to be held up while credit information is being obtained.

On the other hand, the credit department can be of great help to the sales department by being reasonably liberal in the granting of credit. A splendid record might be established by a credit department showing a very low percentage of bad accounts, but by such drastic action that the salesmen would make a very poor showing and such a volume of business be lost that the profit on same would have more than covered the losses twice over.

It is not my province to attempt to instruct you gentlemen in the art of salesmanship nor to evolve new methods whereby the credit man can make a perfect score in his favorite pastime of picking credit risks. I simply want to establish in your minds the thought of how closely, how intimately these two business branches are connected. How absolutely dependent they are upon each other. The thought, that the more heartily, the more earnestly these departments work together, the more successful and profitable will be the business where such relationship is shown.

The Group Idea in Arranging Merchandise

BY ROBERT FALCONER

(Do you arrange the stock in your store according to size? Do you show more than one type of iron in window display? Here is a worth-while article which tells you why you shouldn't do either of these things and suggests a practical idea for show windows and stock arrangement which has already been adopted by furniture establishments and department stores. —The Editor.)

When we look at a picture painted by a great artist we find but one idea expressed in it. There is one central thought that stands out prominently and about which everything else is grouped. When we read a good story we find that the whole thing is built around one central idea. Even in music we find that there is one central theme about which the whole tune is woven. In all art there is concentration. Unless the mind is concentrated upon one idea or object there appears to be confusion.

Concentrating the Mind

The French people are a very artistic people. For this reason we might expect that they would be clever in making winning displays of the goods in their stores; that they would be able to bring about this concentration upon one idea or one thought. When one walks along the boulevards and avenues of Paris and studies the show windows he will find that this is actually the case. Many of these windows appear crowded from an American point of view, but everything being built into a single idea, there is no confusion. There is merely a desire to spend some money. Often to spend more money than one has in his pocket. It is hard indeed to save one's money in Paris just around Christmas time.

In making displays, it is not the number of articles displayed, the variety of articles displayed or the difference in size of the articles displayed that must be considered so much as it is whether the grouping used will cause confusion or will serve to concentrate the mind of the observer upon the idea to buy. In making displays either in the store, sales room, or window, it is well to take special precautions against causing confusion. To avoid these it is always wise to make the displays around some central idea. For example, group the displays in accordance with the utensils and appliances that can be used in different occupations. Just grouping a lot of appliances of the same kind together will not result in nearly as many sales as grouping a number of articles, utensils and appliances that can be used in a certain room.

Good but Not Very Good

Stack a long line of different makes of flat irons on a table or shelf, do the same with lamp shades, portable lamps, ranges and the other things carried in stock, and a certain number of sales will be made. This number, however, will not be the maximum number possible. Such an arrangement does not tend to increase the desire to purchase. Instead it tends towards confusion. A purchaser has already decided to purchase an electric iron. He has not decided upon the make he will buy but he has decided to buy an iron. He enters the electric shop. There he sees a long line of different makes of irons. He

must make a decision now upon the make he will buy. He becomes confused, undecided, and he may not buy at all.

Grouping Related Stock

Suppose that instead of this large collection of irons he had been led back to the rear of the store where there was a group of all the different electrical appliances that can be used in a laundry but only one make of each utensil, device or appliance was displayed. This prospective purchaser would not hesitate about purchasing the iron. There would be only one to attract his attention and he would buy that one. He, however, would not only buy the iron but would become interested in some other laundry equipment. It might be a washing machine, an electrically driven and heated ironer or some other convenient machine. The chances are that his interest can be greatly aroused in one of these machines. There is a possibility of selling one or more. Instead of nearly or actually losing a sale of some \$6.00, a change in the arrangement may increase the sale to several hundred dollars.

This simply indicates the money value of avoiding confusion. No artist ever sold a picture for an extremely high price unless the picture was painted around some central idea. No merchant can get the best results from his displays unless the objects, the goods shown in that display are grouped around some central idea. It does not make so much difference what the idea is as it does whether or not the display is properly related to this idea, whether or not the goods exhibited are effectively grouped around this central theme.

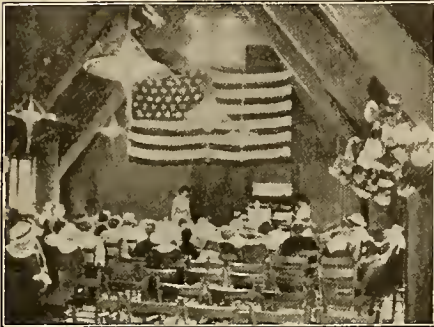
According to Use, Not Size

The simplest and easiest method for any dealer in electrical supplies to use in arranging his store or sales floor as well as in making his window displays is to group his display according to use. At first thought, this may not appear to be so convenient as the old way. It may seem that more work is being placed upon the clerks than would be the case if all goods were grouped as they would be in a warehouse. Selling goods is not always the same as storing the same. It is not the object of display groupings to make it easier for the clerks as much as it is the object to make it easier for the customers to make up their minds to spend their money for these goods.

Group the goods according to their uses instead of according to their sizes and the sales immediately begin to increase. It is some more trouble to do this than to follow out the old method. It requires a different arrangement of shelves, counters and tables, but the increased sales more than make up for the added expense.

Western Ideas

USING THE CHURCH was the method of demonstrating ranges instituted by a California public utility in small towns. Not only did the church often provide the only large gathering place in the community, but the women, usually including most of the housewives of the region, had a special interest in the performance and were enthusiastic spectators of the demonstration. Such a campaign was carried out by the Pacific Gas & Electric Company last sum-



Demonstrating an electric range in a church—a campaign which brought results.

mer and was so successful that in three days; demonstrations in each of 21 towns brought orders for 150 ranges.

Mrs. C. E. Dwelle, head of the electric company's domestic education department, had charge of the demonstrations.

In the smaller towns, where gas is not available, electric cooking has things pretty much its own way among housewives who put any value on comfort and convenience. In a typical town the method of attack was to secure a suitable meeting place and have a Westinghouse range installed. Page advertisements were run in local papers announcing the demonstration. During three days the working of the range on actual cooking was shown. After each demonstration a salesman of the company rounded up the likely prospects and in the next few days they were approached with a sales proposition. In one town of 2500 population 30 ranges were sold.

The campaign as a whole was under the supervision of Mr. Adolph Straub, head of the range sales department of the Pacific Gas & Electric Company.

CONCENTRATING ADVERTISING is the plan of the Duluth Society for Electrical Development. The society is made up of contractors, dealers, central stations and jobbers who together this year will spend from twenty-five to thirty thousand dollars for local advertising of electrical household devices.

The northern merchants of the Gopher state (Minnesota) are awake to the possibility of merchandising electric labor saving devices, by concentration and close cooperation, as their plans for 1919 show.

Of course, they first had to organize—which they recently did and called themselves "The Duluth Society for Electrical Development." When asked

to explain just what this organization had accomplished, expected to do, and what difficulties they encountered, one of their active members, Mr. W. A. Grimes, manager of Northwestern Electric Equipment Company, Duluth, said:

"We had a message we wanted to carry to the people of Duluth. It was, that 'Electricity is the cheapest Good Thing in Duluth.' You know that this is true in your city. It is particularly true in Duluth as our maximum rate is six cents per kilowatt.

"We decided to quit talking in 'kilowatts,' 'amperes,' etc., as Mr. and Mrs. Buying Public does not know what you mean. Can you imagine a department store advertising ribbon at so much per meter? No, because department stores are run by merchants, and merchandising is making it easy, not difficult, for customers to buy your wares.

"Today, you go into a store selling electrical appliances in Duluth and ask a clerk the cost of operating an electrical appliance and it is told you in understandable English, three cents per hour, or whatever the cost may be. You can call on all of the stores, selling appliances, and your answer will be the same. The Society made a list of all appliances and the cost per hour of operating same and furnished the various members with as many copies as they could use.

"Another way we decided to follow the department stores was to advertise the same article at the same time. During the month of March, for example, all dealers are to feature the sale of washing machines. The bulk of their advertising will be devoted to this one item. There will be small ads on other appliances each week in the month devoted to some seasonable electrical appliance, as example: Heating pads—March 2nd to 8th; sewing machine motors—March 9th to 15th; waffle irons—March 16th to 22nd, etc. The same idea as going to a carnival—the big show going on all of the time and the side shows holding their Bally Hoos so as not to interfere with the big show and with one another. Each month during the year, we will feature some one article and run small ads on the other devices. The main reason for concentrating all advertising on the same subject is to prevent the housewife, who has \$10 to \$100 to spend on electrical labor-saving devices, from spending it on a new talking machine or davenport, on account of our inconsistency. In the past, Mr. A. would advertise washing machines; Mr. B., vacuum cleaners; Mr. C., electrical dishwashers; Mr. D., electric mangles,—each stating their respective articles the greatest labor-saving device, and the result is, Mrs. Housewife becomes confused, cannot decide which she wants, and spends her money for some device, not electrical.

"The meetings of the Society are held once a month. They consist of a dinner and a general discussion along lines to boost the sale of electrical appliances. If some member has a new thought, he passes it along and it is tried out. While in the meeting, all members act and talk as though they are working for one organization. Outside, competition is keen, but upon a legitimate basis. The meetings are simply a 'get-together' movement of central station, contractor-dealers and jobbers.

"Duluth is ninety-seven per cent wired. Duluth sales of washing machines, vacuum cleaners, mangles, flat-irons and all types and kinds of electrical appliances are as great as any town of the same size in the country. The Duluth Edison Electric Company, the central station, sells all types of appliances. They advertise and have an up-to-date display sales room. Their advertising is one of the main reasons for the popularity of electricity and electrical appliances in Duluth. Their efforts and their advertisements have sold thousands of dollars' worth of appliances, which the consumer has bought through the dealer. The Society in Duluth is keenly in favor of the central station merchandising all types and kinds of electrical appliances."

The Gopher state electric merchants are setting a mark for electric appliance sales and going after it systematically, as Mr. Grimes says:

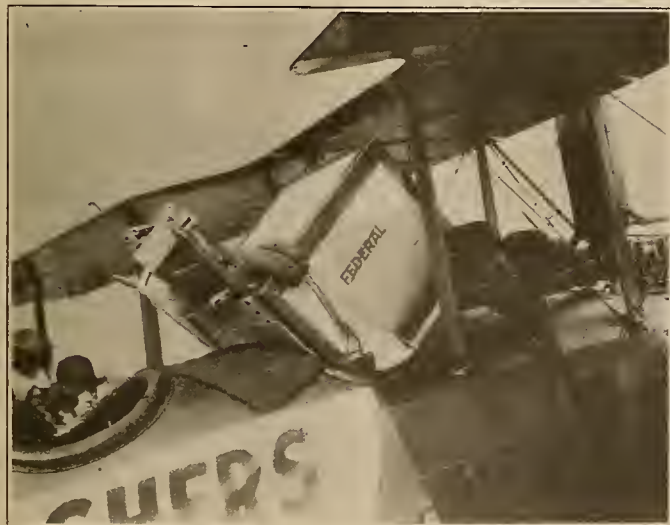
"There are twenty-two thousand residential consumers in Duluth. Fifteen per cent, or so, have washing machines and a proportionate amount of other electrical appliances. When the percent of washing machines is fifty, and the other appliances in proportion, then we will know that the Buying Public has faintly heard our message that 'Electricity is the Cheapest Good Thing in Duluth.'"

ADVERTISING SCHEME OF ELECTRICAL DEALERS FOR YEAR 1919

Week	Main Articles	Sub Articles
Sunday. Saturday.		
Mar. 2—Mar. 8	Washers	Heating Pads
9—15	"	Sewing Mach. Motors
16—22	"	Waffle Irons
23—29	Week of Heaviest Adv.	Air Heaters
30—April 5	Cleaners	Air Heaters
April 6—12	"	
13—19	"	
20—26	Week of Heaviest Adv.	Convenience Outlet
27—May 3	"	Convenience Outlet
May 4—10	Sewing Machines & Ranges	
11—17	"	
18—24	"	
25—31	"	Immersion Heaters
June 1—June 7	Washers	Irons
8—14	"	Percolators
15—21	"	Grills
22—28	Week of Heaviest Adv.	Waffle Irons
29—July 5	"	Toasters
July 6—12	Irons	Irons
13—19	"	Toasters
20—26	"	Percolators
27—Aug. 2	"	Grills
Aug. 3—9	Ranges	Sewing Mach. Motors
10—16	"	Irons
17—23	Ranges & Sewing Machines	Toasters
24—30	"	Percolators
31—Sept. 6	"	Grills
	Week of Heaviest Adv.	
Sept. 7—13	Cleaners	Double Sockets
14—20	"	Immersion Heaters
21—27	"	
28—Oct. 4	Week of Heaviest Adv.	
Oct. 5—11	Air Heaters and Fixtures	Waffle Irons
12—18	"	
19—25	"	
26—Nov. 1	"	
Nov. 2—8	Sewing Machines	Heating Pads
9—15	"	General Advertising
16—22	"	"
23—29	"	"
30—Dec. 6	"	"
Dec. 7—13	"	"
14—20	"	"
21—27	"	"
28—Jan. 3	"	"

AERIAL DELIVERY of merchandise, like electrical development thirty years ago, is "in its infancy"; but a start has been made and only the future can show how far transportation of goods through the air will be adopted as a special or emergency measure in industrial operations.

For the first time in its history the Federal Sign System (Electric) of Chicago delivered a standard



An advertising stunt—as well as a prediction of what the future may bring

electric washing machine of its manufacture by aeroplane on March 11. The start for the journey in the air was made from Grant Park, on the Lake Front, about 1 p.m. and was witnessed by a number of spectators. A washing machine weighing about 180 pounds was strapped in the front cockpit of the aeroplane and was delivered to Evanston, the home of

the purchaser, Mr. Rufus C. Dawes, in about twelve minutes, the distance being about twelve miles.

The machine used was a standard United States Army Dayton-Wright training plane driven by a 110 h.p. Curtis engine. This machine, having been purchased from the United States Government, is the property of Lieut. Ralph C. Diggins, who was the aviator who conducted the flight. Lieut. Diggins was in the 92nd Aero Squadron.

ADVERTISING SERVICE is the point of one of these effective little cards issued by the Rochester Electrical Contractors and Dealers' Association. This particular association is a very active one, and has accomplished a great deal of good for the electrical

The Electrical Contractors' Association of Rochester

Meets at Richford Hotel every Thursday evening at 6:30 for the general discussion of Electrical Business Problems

FIRST THURSDAY: Subjects of special interest to Architects and Engineers.

SECOND THURSDAY: Subjects of special interest to Jobbers and Dealers.

THIRD THURSDAY: Subjects of special interest to Contractors.

FOURTH THURSDAY: Subjects of special interest to Labor.

Meetings open to all interested.

Dinner 60 Cents.

You Don't Look So Good!

When you buy *electrical goods* anywhere other than in an *electrical store*, you are, for the moment, a *good customer*. But should anything go wrong with the device, and you take it back for repairs, you are, from then on, a *nuisance*! And in the end you take your troubles to a specialist—an *electrical dealer*.

MORAL—Start right—buy *electrical goods* from an *electrical dealer*. He will furnish the proper advice at the time, and *service* afterward.

Rochester Electrical Contractors & Dealers Association

Two cards gotten out by the Rochester Electrical Contractors and Dealers' Association which advertise the association to the contractor-dealer and the contractor-dealer to the customer.

industry in Rochester and the immediate vicinity. Their meetings are held regularly, and largely attended, and from time to time they get out cards of this nature, which carry an interesting message for other electrical dealers.

They are taking advantage of one selling point very frequently overlooked by the average electrical dealer, that is, he fails to bring into his sales arguments the question of service. The only reason a householder buys electrical goods from an electrical dealer rather than a hardware store or a department store, either of which may be more conveniently at hand, is because the customer looks upon the electrical dealer as a specialist with special knowledge to advise him and to maintain the appliance he buys. It is this service which sells the "buy-at-an-electric-shop" idea—and it deserves just such advertising as it is here given.

Perpetual Motion Machines

BY B. F. JAKOBSEN

(What is a perpetual motion machine? Is there any chance of a new force being discovered which will make such a thing possible? The recent credence given to the discovery of Garabed makes this discussion of popular conceptions and underlying theories one of particular timely interest. The author is a well known electrical engineer of San Francisco and Berkeley. —The Editor.)

Is a perpetual motion machine possible? The United States Patent Office evidently thinks not, since no patents can be issued on such inventions or claims. Professor Kroman, University of Copenhagen, some years ago dealt with this question in a scientific manner, and the following is borrowed largely from his lecture.

A perpetual motion machine is not merely a machine where all friction has been eliminated, and which therefore would show an efficiency of 100%. It is a machine, as for instance a storage battery, which when a certain amount of energy has been stored in it, would return a certain percentage of

since both take energy from the surroundings and do not create energy.

In other words a perpetual motion machine must create energy, and this brings it at once into conflict with the theory of the constancy of energy or the conservation of energy. But this is only an empirical law and therefore can only apply to forces which we know today, and moreover scientists are not nearly so certain of this law today as they were a generation ago.

Let us try to determine what kind of forces must exist in order to make a perpetual motion machine possible. The forces that we know today, such as for instance gravitation or magnetic and electric attraction are central forces, i. e., the forces existing between masses A and B in Fig. 1 lie in a straight line connecting these two masses, the two forces are equal but act in opposite directions, they depend only upon the distance between the two masses and they do not vary periodically with time. If this holds good, it is apparent at once, that whatever work is obtainable by letting A approach to B (A being a weight, for instance, and B the earth) is obtainable only once, since we shall have to expend the same amount of work in pulling A back to its original position, which was gained by letting A approach B. And since the distance between A and B is finite, they must finally come together (if not pulled apart after each movement or after a certain movement), and the work derivable would come to an end.

This notwithstanding, many solutions have been offered. Fig. 2 shows a favorite solution. The balls slide on the spokes of the wheel, which therefore rotates around the shaft C. In Fig. 2 the two lower balls balance each other, but A outbalances B and the wheel will therefore turn. But after it has turned once, the two balls A and B will never come into the relative position shown in Fig. 2 and friction soon stops the wheel. Whatever work is gained on the left side by letting the balls move towards the earth is lost on the right side by having to bring them away from the earth. No matter how many or how few spokes, whether they be straight or curved, whether they be provided with one or several hinges or none at all, the same amount of work must be spent in lifting the balls as they will yield in falling on the left side of the shaft, and no energy can be created.

Another popular mechanism is illustrated in Fig. 3. N is the nordpole of a long magnet. AD and AC are two inclined planes so joined at A that the ball can roll down one and up the other. The ball is set in motion and the theory is that the magnet will attract the ball rolling up AD so that it will arrive at D with considerable speed and will fall down onto track AC at C and now gravitation takes hold and

Fig. 1.

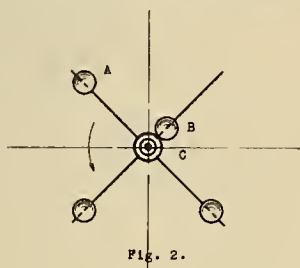


Fig. 2.

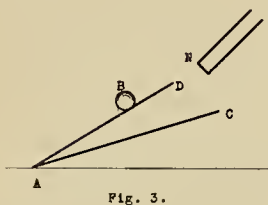


Fig. 3.

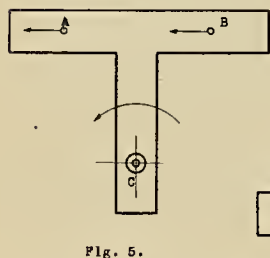


Fig. 5.

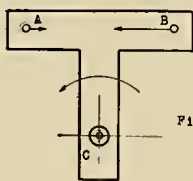


Fig. 4.

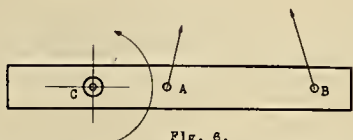


Fig. 6.

The forces we know today operate in a straight line as illustrated by Fig. 1.—With any known force or any which may be discovered also operating in a straight line and of constant magnitude, perpetual motion is obviously impossible. Figures 2, 3, 4, 5 and 6 are popular "solutions" of the problem which are daily being rejected by the Patent Office.

this energy every year, as a bank returns \$4 per year on a deposit of \$100 and continues to do this (in theory, at least) not only for 25 years, but forever.

If 100 kw-hr. was stored in such a battery, it would yield, for instance, 4 kw-hrs. each year indefinitely; during 100 years it would yield 400 kw-hrs. in spite of the fact that only 100 kw-hrs. were originally put into the battery.

And our perpetual motion machine must do this without taking energy from its surroundings, no matter how skilfully this may be accomplished. Erecting a windmill at a place where there is always some wind, is not a solution; erecting a water wheel in a body of moving water is not a solution, either,

gives it still more speed, and so on. The trouble is that gravitation also acts while the ball is being attracted by the magnet on its way up AD and the magnet also attracts the ball while on its way down AC, and in such manner that the ball gains no momentum from either, since it loses on its down trip what it gained on its up trip.

And no matter how ingeniously these elements be arranged or how many of them we arrange, the result is invariably the same, because we are dealing with central forces and what is gained when going away from the earth or a magnet is lost when approaching it, or vice versa, no matter whether in a straight line or following the most fanciful spiralled curve in space.

If two magnets or two masses A and B in Fig. 4 attracted each other with unequal force, we could simply mount them on a frame and they would turn around shaft C as illustrated and act like a motor. The masses A and B having been magnetized once, as permanent magnets, we would have a motor which would turn out work for all eternity.

The same happy outcome would result if magnets or bodies acted on each other as illustrated in Figs. 5 and 6.

If the two forces acting on A and B in Fig. 1 were smaller in the forenoon than in the afternoon, then we could gain energy by moving them apart in the forenoon and letting them work together by attraction in the afternoon. But we know of no forces acting in this accommodating fashion.

An electric current flowing in a straight conductor acts on a nordpole in such manner as to make it travel around the conductor, i. e., its action is not in the connecting line between the conductor element and the pole, but at right angles to it. But unfortunately we know of no way to make a current flow permanently in the same manner as we make a permanent magnet.

Before we can listen to any inventor of perpetual motion machines or machines having efficiencies of more than 100%, he must show that he has discovered fundamental forces in nature which are not central forces, as defined above, for these acting as shown in Fig. 1 and not being periodically variable, will not create energy.

A Congressional committee was reported to have spent considerable time last year investigating a machine giving more than 100% efficiency, so the problem is not dead yet.

Electric Filtration Plant

BY R. U. STEELQUIST

(An electrically pumped, electrically filtered water supply is that of Albany, Oregon. The new filtration plant, of which the details are here given, is one of the most up-to-date in the United States, with a most complete equipment. The author of this interesting summary is manager of the Mountain States Power Company.—The Editor.)

The water supply for the city of Albany, Oregon, is furnished by the Mountain States Power Company. It is taken from the Santiam river whose waters come from the foothills and mountains of the Cascade Range. From the point of diversion from this stream the water is carried in a canal across

from zero to 5 or 6 respectively, which provides Albany with an excellent water supply.

The filtration plant that treats the water is of concrete and brick construction and its equipment is the most modern and effective procurable, as is evidenced by the consistently high efficiency of the



Albany Filtration Plant, showing settling basins and control valves with head house in the background



Operating floor of the filter.—Note the electrical recording instruments at the back of the picture.

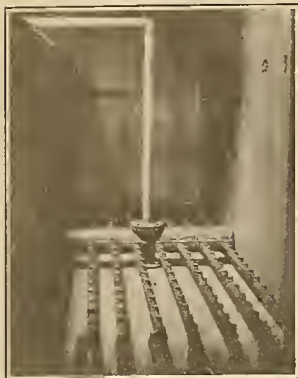
country to Albany where power is developed and a part of the water is treated for domestic and general community use.

The bacteria content of the raw water varies from 50 to 1500 per c.c. depending on season and rain or surface water condition. By the operation of the filtration plant these have been reduced to

filtration process. The system in use is commonly known as the gravity type of filtration.

The raw water is pumped from the canal by a triplicate installation of 6 in. centrifugal pumps driven by 10 horsepower motors. Into the discharge from these pumps is fed the chemical solutions that develop the floc which is the real filtering agent.

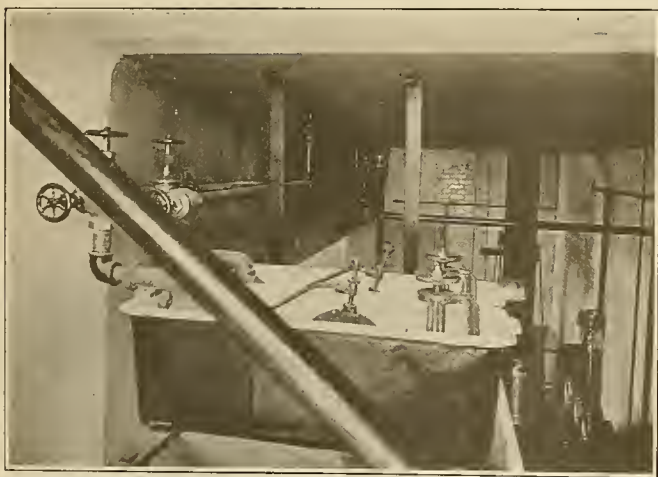
The coagulant used is aluminum sulphate which forms the floc by reaction with the alkalinity of the water. Because of the natural softness of the raw water this alkalinity is produced by the use of a soda ash solution. These two solutions are made up in proper strengths for the varying condition of the



The underdrain system in one quarter of the filter. The plant is equipped for 6 filters of 500,000 daily capacity, 4 of which are now in use.

raw water and supplied through orifice control tanks, to the raw water on its way to the concrete settling basins of 360,000 gallons capacity.

After remaining in the settling basins for about five hours the water passes by gravity to the filters. The supply to the filters is automatically controlled, so that the amount of water handled is proportioned to condition of cleanliness of the filters. The plant is equipped for six filters of 500,000 daily capacity each, of which four are now in service. The collecting heads are covered by nine inches of gravel



The orifice tanks for the coagulant—soda ash and aluminum sulphate

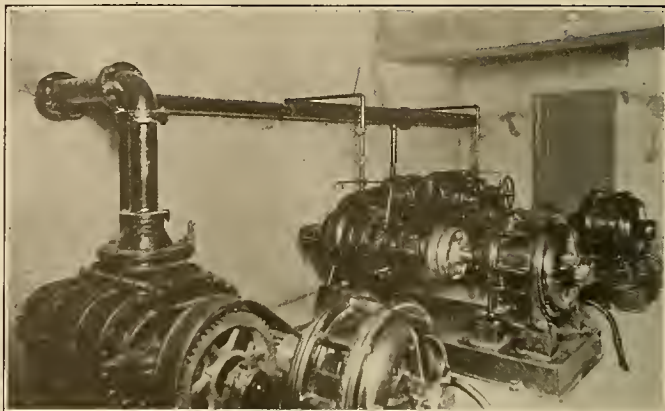
upon which twenty-seven inches of sand, graded as to size, completes the mechanical filtering equipment. The floc arrested by the sand surface is the effective filtering agent.

As the process of filtering continues the filter surface becomes choked, which condition is indicated by a loss of head gage. The filter is then cut out and cleaned. A duplicate set of eight-inch centrifugal pumps driven by 25 horsepower motors supplies the filtered wash water for cleaning and the sand bed is further agitated and aerated by air supplied by a Roots blower driven by a 25 horsepower motor.

As the water passes from the filters to the clear water well or storage it is further treated by the introduction of chlorine which contributes to the effectiveness of bacteria removal.

It may be noted that electric power plays a most important part in this production. In addition to the uses mentioned a 7½ horsepower motor operates an elevator to carry the chemicals to the top of the deadhouse where the tanks for preparing the chemical solutions are located. Here a small motor is used to operate an agitator in one of these tanks.

The purified water is drawn from the storage well and pumped to the city by one or more of three pumps. One of these is driven by a rope drive from



The air blower in the foreground and duplicate wash water pumps for cleaning the filters in the rear

a vertical water wheel. The second, a triplex pump, used mainly for fire purposes, is driven by an 85 horsepower motor. The third is a centrifugal service pump driven by a one hundred horsepower motor.

LETTING THE CUSTOMER read the meter is the system in vogue with the Vallejo Electric Light & Power Company to secure the reading of all meters. Each month these cards are given to the meter readers, and in the event that he finds it impossible to get a reading, one of these cards is placed

FORM 36 2M-10-C

.....191..

N.....

..... Route.....

Our meter reader has called and has been unable to get a reading.
If you will kindly mark on these dials the position of the hands on your meter, your figures will be accepted for computing this month's bill.
Please date and sign this slip and leave at our office, or mail same at your early convenience.
Respectfully,

VALLEJO ELECTRIC LIGHT & POWER CO
428 GEORGIA STREET

By Date read191..

This self-addressed postcard is left under the door by the meter reader if the family is not at home

under the door, with the anticipation that the consumer will fill it out and send to the office. This system has been tried out since July, 1918, and the company finds that they obtain about 70% of the cards left, properly filled out, and either mailed or brought to the office. Before they started this system they had a large scattering list each month, due to the fact that they were unable to get meter readings in the first place, and sometimes after several visits could not get a reading. With this system they have reduced their scattering list to a minimum.

Insulator Selection from a Manufacturing View

BY ROBERT M. JOHNSON

(The insulator and its selection is a subject of great timely interest in the West, where long distance transmission of energy prevails to such a vast extent. The last issue of the *Journal of Electricity* gave the specifications which insulators should measure up to as reported by the engineering committee of the Pacific Coast Section N. E. L. A. Here is a discussion of this interesting subject by one of the engineering staff of the Jeffery-DeWitt Co.—The Editor.)

You can form a good idea of the ruggedness of an insulator by dropping it on a concrete floor, of its electrical and mechanical properties by tests, of its dimensions by drawings; but how can you form an idea of its most important property, uniformity? The answer is, by uniform actual tests on the largest possible quantity, or upon representative samples of the largest quantity available at the time of decision—you yourself to select the samples and tests. If you recognize the weakness of tests to imitate lightning and other line conditions, you will value tests designed to show the variation in ultimate dielectric strength and factors of safety available. If you deny the value of all tests and claim line experience as your only guide, you must admit that these insulators represent factory conditions which existed, but which may be much better, or perhaps worse today. You must also admit, that the engineer's job is largely the doing of things which have never been done before in the same way. A repeater is not an engineer. An engineer must reason from the known, to the plane unknown, and if his reasoning is not correct, his work fails. Above all, progress and success depend upon courage of conviction. Our mistakes are beneficial if they are not repeated.

The insulator problem will be solved as other problems of civilization are being solved—by specialization, standardization and cooperation—particularly the latter. Let ceramic and manufacturing engineers get together with power transmission engineers, as both may have certain sincere opinions and valuable instincts which they should share. The seller in most lines goes to the buyer, but in this case, as in a few other lines, there is an advantage to the buyer in seeing with his own eyes what he proposes to buy at the time he does the buying.

The argument that the matter of uniformity is taken care of by the routine tests and inspection, when the insulators are produced, is faulty. Experience has proved this, and a selection has already been made when the routine tests are started. The inspector often lacks your broad experience in insulator operation and production and his reports may be misleading. His work may be very thorough in some unimportant feature and entirely overlook some general weakness which will be the cause of future trouble on your line. Experience has proved this also.

The following convictions are offered for comparison with your own on the subject of insulator selection: Without discussion of undesirable properties, troubles, theories and cures, the desirable properties in line insulators may be summed up in two words—uniformity—ruggedness.

In selecting porcelain as the material for line insulators, engineers were convinced of its greater ruggedness and durability as compared to glass or any organic compounds. They soon learned, however, that uniformity was not attainable commercially. The routine electrical test was adopted of necessity, as soon as porcelain was adopted. The history of insulator development was for twenty years marked by the development of tests and expedients designed to insure insulators of maximum uniformity, though made of porcelain, which plainly was not uniform. The greatest step towards uniformity was taken in the development of the multiple pin type insulator. The part test weeded out all porcelain below a certain standard of dielectric strength. The nesting together after the test gave a certain uniformity of quality

according to the laws of probability and also a degree of electrical ruggedness, because puncture strength was greatly increased in proportion to flashover voltage. Operation of some of the three and four piece pin type insulators was quite satisfactory some twenty years ago.

Then came the suspension type of standardized unit, which made a strong appeal to the manufacturers and also to the operating companies. Some of the bitter experience of the past was ignored by both parties and the two and on piece "high efficiency" suspension disc was put out in enormous quantities. Some companies who have used suspension insulators on 33,000 volts because it was the fad, have had a chance to compare the operation of the suspension type with the old pin type insulators. The verdict is unanimous that something is, or at least was, very wrong with the suspension type insulator. Uniformity, ruggedness and durability seemed to be lacking. This is not an argument for pin insulators, for they are strictly limited in usefulness; nor does the suspension disc type of insulation need any more friends. The friends of the suspension insulator need more uniformity, ruggedness and durability in their insulation, that is all.

Uniformity can be secured either by the method of nesting shells, as in the pin type, or by adoption of radical changes in manufacture which insure a really uniform quality of porcelain. The latter has been considered impossible in insulator work, because of the many variables. It can only be effected by radical departure from time honored potters' methods. This method of obtaining uniformity has always seemed the correct one to the writer, and he has never questioned that if the uniformity could be made real and could be demonstrated, it would have deciding weight with electrical engineers. After some ten or twelve years of effort, a commercially uniform porcelain does not seem to the writer to be out of reach.

Ruggedness is a quality harder to define, but more easily obtained, being more a matter of design and less one of material accomplishment. Ruggedness suggests reserve strength and factors of safety in an insulator, which render it fit to survive any and all conditions which may occur in service. Mechanical ruggedness involves more than mere tensile strength in a suspension unit. There must be ample tensile strength and also ability to withstand vibration and shocks from accidental or malicious causes. Heavy masses of porcelain, coupled with some flexibility, at once suggest themselves as best meeting this requirement, the strength increasing as the cube of the thickness. Heavy discs also resist thermal strains due to weather changes, and are much better able to resist power arc destruction. Electrical ruggedness is of greater importance than some engineers would have us believe. A large factor of safety against direct puncture used to be considered vital and will be so considered in the future. Designers of structural steel allow double or triple the usual factors of safety when dealing with shocks and uncertain loads.

What about the uncertain stresses caused by lightning and other high frequency discharges, which are not possibilities, but certainties, on a transmission line? Do we provide extra factors of safety? No, we take a variable material like porcelain and make insulators with no factor of safety worth mentioning. They are flashed over at the factory and

punctures eliminated. Is this test more severe than they will receive when lightning strikes the line, or surges occur? It is common experience to have specially selected and tested insulators fail by puncture on some competitive or design test, where the insulators are supposed to be on good behavior. This experience is so common, in fact, that engineers have come to attach no importance to it. This matter of dielectric ruggedness cannot be evaded by using more units in series. It is up to each unit to have a large excess of puncture value above flashover value. We have read papers belittling the importance of excess of puncture strength, but we have also read papers by these same engineers, showing by actual test, that punctures occur to a far greater extent on complicated networks, because of the greater number of surges prevalent on such a system. The theme was gone into very elaborately according to the theories of probability and the conclusion reached, that networks and frequent switching were to be avoided if "insulator depreciation" and prohibitive interruptions to service were to be prevented.

The mention of insulator depreciation brings up the question of durability. Before the advent of the suspension type insulator, little was heard of insulator depreciation. To be sure, there were insulator troubles, but they were traced directly to power arc destruction, or cracking, or "puncture by lightning," or porosity. No mention was ever made of mysterious molecular changes in the porcelain or progressive checking along the "cleavage planes of some of the crystalline ingredients." The fact that insulators have shown progressive depreciation after two, three, or five years of service, can hardly be blamed on porcelain. Porcelain has endured a dozen centuries under very adverse conditions. It should endure a good many generations on a transmission line, if it has the necessary ruggedness and uniformity. These are dependent on design and manufacturing methods.

In the early days, the insulators were allowed to stay in service until "something happened" to an insulator to destroy it. This practice, however, when followed on early suspension insulator lines, resulted in something happening to enormous numbers of insulators at about the same time, say after two to five years' service. Engineers, therefore, sought to locate defective insulators before disruption of the entire service should take place, and the portable megger was introduced for approximating the resistance of the insulators in service. The megger disclosed the fact, that insulators lost their insulating properties progressively, from year to year. Hence, the term insulator depreciation or deterioration. Numerous causes have been considered the cause of this trouble by various engineers. The opinions, however, may differ because many causes are at work instead of just one—may they not? In some cases, cracks have been found, caused apparently by thermal-mechanical causes. In other cases, puncture has occurred without cracks. In other cases, no defect could be located, except the low resistance reading. Occasionally, whole strings have been found punctured or destroyed by arcs. Failures by pulling apart have been few, because insulators used to be bought largely on a matter of ultimate tensile strength, and flashover value per unit of cost.

Durability of insulators, therefore, while dependent on quality of porcelain to the extent that it must be real vitreous porcelain, capable of resisting the penetration of traces of moisture and reasonable mechanical strains, is most dependent on correct design to keep all mechanical, thermal and electrical stresses within safe limits and upon the uniformity of product which will insure these factors of safety within reasonable limits. Given ruggedness of design and uniformity of manufacture, insulators will endure beyond most of the other equipment on a transmission line. The old practice of operating without continually meggering and replacing thousands of insulators, may then be resumed.

Modern Equipment in an Industrial Plant

BY JOHN H. LONGFELLOW

(The growth of manufacturing enterprise in the West has been one of the interesting features of the recent period. Ship building and other war activities have brought attendant factories to meet their needs—and the West is stepping forward along these lines as along others of electrical development. The following article gives a brief description of an electric machinery plant recently constructed in the Northwest.—The Editor.)

The Pacific Northwest is experiencing a protracted period of industrial activity and electrical development is making possible the results being attained. Gray & Barash, Inc., electrical engineers, have met the issue by constructing what is claimed to be the largest and best equipped shop of its kind in the West, located at 63 Horton street, Seattle.

This concern specializes in building large transformers for electric furnaces, overhead type electrically operated traveling cranes, repairing and rewinding of electric motors and the redesigning of every type of electrical machinery. They also include among their activities repairing and rebuilding of air compressors, saw mill machinery and steam engines. In order to properly handle these many lines they constructed and moved into the new plant recently.

The building containing the machine shop and electrical department is 80 by 160 feet with trackage extending its full length and arranged for loading or unloading cars either into the main building or the warehouses, with traveling cranes. For handling heavy machinery a 20-ton overhead type electrically

operated traveling crane runs the full length of the building, and 3-ton traveling cranes are in use over all assembling and winders' benches. The moving of machinery by hand is therefore practically eliminated, materially reducing the cost of handling.

On the main floor is installed a full line of modern machine shop equipment, selected particularly for the nature of the work handled by the plant. This floor is also used for the assembling of all heavy machinery and for testing of all machinery or equipment built or rebuilt in the shops. For doing this there is a complete testing equipment from which alternating current at voltages of 110-220-440-550-1100 and 2200 volts, in two or three phase may be drawn. In addition voltages as high as 50,000 in graduated steps may be secured for testing dielectric strength of insulating materials and oils. Direct current of 110-220 and 500 volts is also available. The testing panels are equipped with recording and indicating instruments of all graduations to properly read the results of the various tests. A live steam line for testing engines and turbines under actual operating conditions is also a part of the equipment.

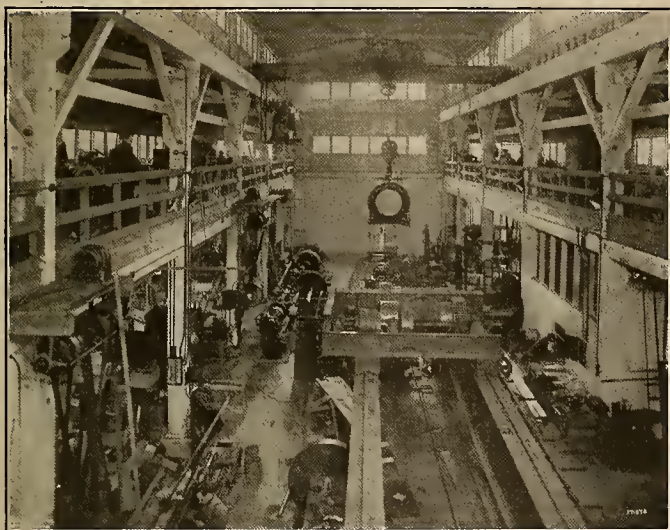


Front view of plant, showing warehouse in the rear of office building and garage

The second floor is given over to the electrical department which extends the entire length of the building. This floor is used exclusively for repairing and rebuilding electrical machinery, having coil winding and taping machines with numerous other devices for saving labor not found in the ordinary repair shop. In handling different jobs, the possibility of confusion has been eliminated by the instal-

work. The machine has the official approval of the United States Government.

The firm, consisting of Arthur B. Gray and Milton D. Barash, was organized in 1905.

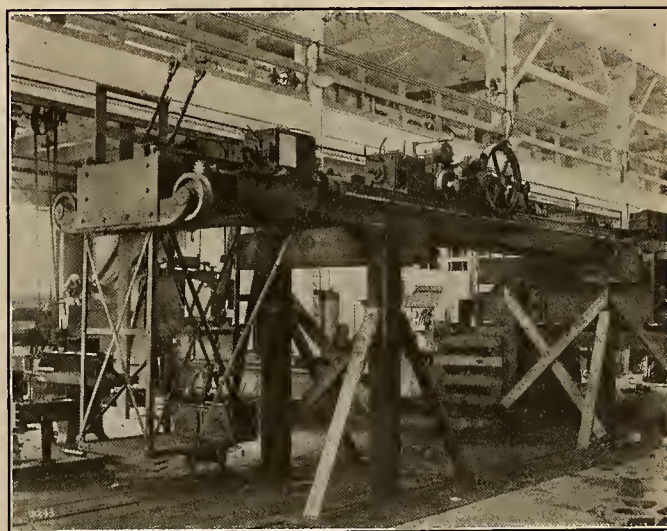


Interior of main shop.—The 20-ton electrically operated crane practically eliminates the moving of machinery by hand.

lation of individual benches for each armature winder. Among the appliances recently installed is a large bake oven for the baking out of large motors and other electrical equipment.

Warehouses containing 25,000 square feet of floor space have been erected for the storage of machinery and the handling of this machinery is done by 20-ton, overhead electrically operated traveling cranes. A large well lighted office occupies the front of the main building.

Approximately 90 per cent of the entire capacity of the plant is being utilized at the present time in constructing electric planing machines which are used in planing the frame work of wooden ships, taking the place of the hand method in doing the



Shop interior, showing traveling crane under construction

FOURTEEN RULES FOR ELECTRICAL CONTRACTING PRACTICE

The following Code of Practice is recommended to architects, consulting engineers, contractors and owners as well as owners' engineers, by the National Association of Electrical Contractors and Dealers, the Executive Committee of which adopted and approved it as a step toward the standardization of many practices in connection with the original contracts and those for extras which, unless definitely settled in advance, leads to misunderstanding on both sides and frequently to controversies and litigation. The National Association does not, however, attempt to bind its members to use this code, but respectfully submits same for the approval of both customers and contractors.

Rule XIII. The contractor shall not include temporary work in his estimate unless the quantities are distinctly stated. In no case should be included in an estimate maintenance or cost of current except on a percentage basis.

Test Data in Substitution of Natural Gas

(The changing over from fuel oil to natural gas in the San Joaquin Light & Power Corporation's steam plant at Bakersfield was one of the war time factors in the saving of fuel oil. The comparative efficiency of the plant and the details of its operating data were the subject of this series of tests recently conducted.—The Editor.)

The following data are the result of a series of tests on the 204 multiple gas burner under a No. 9 boiler at the San Joaquin Light & Power Corporation's steam plant at Bakersfield. In comparing the gas against fuel oil, it was assumed that 14 lbs. of water are evaporated by 1 lb. of fuel oil. Tests show that only $13\frac{1}{4}$ lbs. of water are evaporated to a lb. of fuel oil, using the gas furnace, but the comparison is not wholly fair, perhaps, as the oil is at a slight disadvantage. The fairer figure of 14 lbs. has therefore been used.

It was intended to work this boiler up to a higher capacity, but owing to feed pump troubles, it was not done. Four more tests were included in the plan and may yet be made.

The average boiler horsepower developed was 665 and the average cubic feet of gas to one barrel of fuel oil was 5834. At the present time 5900 are being used.

FIRST TEST, JANUARY 28, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 470 to 501 deg. Fahr.
Stack temp. ranged from 560 to 570 deg. Fahr.
Feed water did not vary from 64 deg. Fahr.
Test ran from 10:40 a.m. to 3:40 p.m.—5 hours.
Water at same level in boiler at finish as at start, with same steam pressure and other conditions.
CO₂ averaged 11.
Weighed water at 64 deg. Fahr.—103,648 lb.
Correcting factor used for, from and at 212 deg.—1.209.
Corrected amount of water used—125,310 lb.
Amount of gas equals 164,447 cu. ft.
Lbs. of water to cu. ft. of gas—.762.
Allowing 14 lb. of water evaporation to a lb. of oil and deduct 3% for steam on oil burners at 336 lb. to bbl.
Boiler horsepower developed per hr., 726.
4704 lbs. of water evaporated to bbl. of oil equals 4704 less 3% equals 4563 lbs. of water evaporated from bbl. of oil equals 4563 div. by .762 equals 5988 cu. ft., equals 1 bbl. of oil.
Note: This was the first test and the men were getting familiar with the running of the test.
Gas burned under pressure of 1.6 in. mercury—.8125 lb.

SECOND TEST, JANUARY 29, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 472 to 499 deg. Averaged 483 deg.
Stack temp. averaged from 470 to 580 deg. Averaged 485 deg.
Feed water did not vary from 64 deg. Fahr.
Test ran from 9:05 a.m. to 4:05 p.m.—7 hours.
Water and steam, etc., at same level start and finish.
CO₂ averaged 11—Draft .21.
Weighed water at 64 deg. Fahr. equals 115,111 lb.
Correcting factor used for, from and at 212 deg. equals 1.209.
Corrected amount of water used equals 137,420 lb.
Amount of gas equals 183,822 cu. ft.
Lbs. of water evaporated to cu. ft. of gas .748.
Allowing oil to evaporate 14 lb. of water to 1 lb. of oil and deduct 3% for steam to burners and 336 lb. of oil to a 42 gal. bbl.
Boiler horsepower developed per hr. equals 569.
4704 lbs. of water evaporated by 1 bbl. of oil equals 4704 bbls. less 3% equals 4563 lbs. of water, equals 4563 div. by .748 equals 6100 cu. ft. of gas, equals 1 bbl. of oil.
Note: Gas burned under pressure of 1.5 in. mercury = $\frac{3}{4}$ lb.

THIRD TEST, JANUARY 30, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 478 to 502 deg. Averaged 483 deg.
Stack temp. averaged from 450 to 490 deg. Averaged 480 deg.
Feed water did not vary from 64 deg. Fahr.
Test ran from 8:59 a.m. to 3:50 p.m.—7 hrs.
Water, steam, etc., maintained at same level start and finish.
CO₂ averaged 11—Draft .28.
Weighed water at 64 deg. Fahr. equals 127,801 lb.
Correcting factor used for water from and at 212 deg. equals 1.209.
Corrected amount of water used 154,510 lb.
Amount of gas used equals 198,713 cu. ft.
Lbs. of water evaporated to cu. ft. of gas—.777.
Allowing 14 lb. of water evaporated to a lb. of oil and deduct 3% for steam on oil burners and 336 lb. of oil to bbl.
Boiler horsepower developed per hr. equals 640.
4704 lbs. of water evaporated by a bbl. of oil, less 3% equals 4563 lbs. of water evap. from 1 bbl. of oil, equals 4563 div. by .777 equals 5872 cu. ft. of gas equals 1 bbl. of oil.
Note: Gas burned under pressure of 1.75 in. mercury = .875.

FOURTH TEST, JANUARY 31, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 473 to 502 deg. Averaged by gauge 485 deg.
Stack temp. averaged from 480 to 510 deg. Averaged by gauge 500 deg.
Test run from 8:35 a.m. to 4:00 p.m.—7½ hrs.
Feed water temp. did not vary from 64 deg. Fahr.
CO₂ averaged 11—Draft .28.
Weighed water at 64 deg. Fahr.—143,052 lb.
Correcting factor used—1.209.
Corrected amount of water used—162,950 lb.
Amount of gas used equals 195,511 cu. ft.
Lbs. of water evaporated to 1 cu. ft. of gas .833.
Allowing 14 lb. of water evaporated to a lb. of oil and deduct 3% for steam to burners and 336 lb. of oil to bbl.
Boiler horsepower developed per hr. equals 630.
4704 lbs. of water evaporated by a bbl. of oil equals 4704 lbs. less 3% equals 4563 lbs. of water. 4563 div. by 833 equals 5466 cu. ft. to 1 bbl. of oil.
Note: Gas burned under pressure of 1.9 in. mercury = .930 lb.

FIFTH TEST, FEBRUARY 1, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 487 to 503—averaged by chart 488 deg.
Stack temp. averaged by chart 500 deg. Fahr.
Test run from 9:30 a.m. to 4:00 p.m.—6½ hrs.
CO₂ averaged 11—Draft .28.
Weighed water at 64 deg. Fahr.—132,923 lb.
Correcting factor used—1.209.
Corrected amount of water used—160,903 lb.
Amount of gas used equals 208,584 cu. ft.
Lbs. of water evaporated to cu. ft. of gas—.771.
Allowing 14 lb. of water evaporated to a lb. of oil and deduct 3% for steam to burners and 336 lb. of oil to a 42 gal. bbl.
Boiler horsepower developed per hr. equals 717.

4704 lbs. of water evaporated by a bbl. of oil equals 4704 lbs. less 3% equals 4563 lbs. of water. 4563 div. by .771 equals 5918 cu. ft. to 1 bbl. of oil.
Feed water temp. did not vary from 64 deg. Fahr.
Note: Gas burned under pressure of 2:23 in. mercury = 1.125 lb.

SIXTH TEST, FEBRUARY 3, 1919

600 h.p. boiler with superheat.
Orifice disc 6 x 3, Grav. 69, Temp. 60 deg. Bar. 14.60.
Co-efficient used 2660.
Steam pressure ranged from 198 to 202 lb.—used 200 lb.
Superheat ranged from 477 to 490—averaged 486 deg.
Stack temp. averaged 500 deg. Fahr.
Feed water temp. did not vary from 64 deg. Fahr.
CO₂ averaged 11.5—Draft .26.

Test run from 8:35 a.m. to 12:35 p.m.—4 hrs.
Water, steam, etc., maintained at same level start and finish.

Weighed water at 64 deg. Fahr.—71,404 lb.

Correcting factor used—1.209.

Corrected water used—97,225 lb.

Amount of gas used equals 120,656 cu. ft.

Lbs. of water evaporated to cu. ft. of gas—.806.

Allowing 14 lb. of water evaporated to 1 lb. of oil and deduct 3% for steam used in burners and oil and 336 lb. to bbl.

Boiler horsepower developed per hr. equals 705.

4704 lbs. of water evaporated from 1 bbl. of oil equals

4704 lbs. less 3% equals 4563. 4563 div. by .806 equals 5661 cu. ft. to 1 bbl. of oil.

Note: Gas burned under pressure of 2 in. mercury = 1 lb.

Stresses and Strains in a Lateral

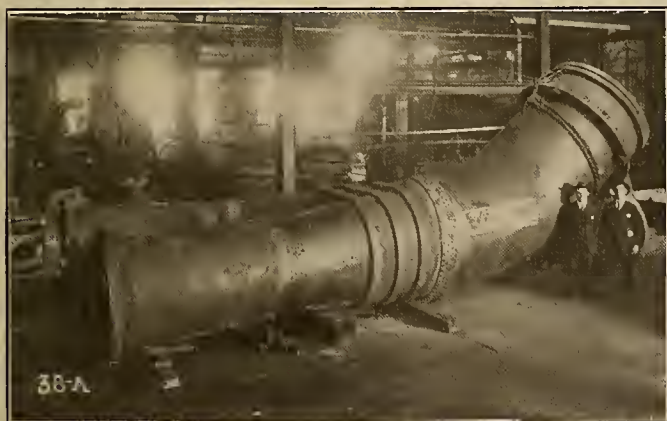
BY E. F. HOLINGER

(The problem of joining a lateral to a pipe which must withstand high pressures, as in the case of a penstock under a 2000 ft. head, involves enormous strains due to static pressure and the flow of water. The accompanying illustrations give some idea of several joints recently completed for use under high heads in Chile—and the brief description explains the method of calculating stresses. The author is hydraulic engineer with the M. W. Kellogg Company.—The Editor.)

In the accompanying sketch is illustrated graphically, the strains, due to static pressure and flow of water in a typical lateral.

Referring to the sketch and the upper leg, we find that, due to static pressure, there is an unbalanced pressure area on both sides of the diaphragm as indicated by the "Section at AA." This unbalanced pressure equals the area of the diaphragm in square inches times the internal pressure. This un-

balanced area reacts on the inner half of this bend the area of the two ellipses, thus projected, times the static pressure, equals 46,260 lbs. This unbalanced area reacts on the inner half of this bend



This illustration shows the manner in which hammer-forge welded pipe from special steel has recently been made for installation in some of the highest head penstocks in the world, situated at the Braden Copper Company development in Chile.

balanced area tends to round out each leg of this lateral and consequently, to part them. Therefore, at this place, in order to hold the legs of the lateral together, it is necessary to put steel bands around. The area of these steel bands is sufficient to carry the total pressure on both sides of the diaphragm to prevent the rounding out effect of each leg, caused by the static pressure.

Further on, on the same upper leg of this lateral, there is a knee bend which causes unbalanced pressure conditions. By dissolving the forces acting on this knee bend into a resultant, we find an unbalanced force of 46,260 lbs., acting on the wedge shaped section, as is done in the sketch, we find that



Special V-piece with slightly different angle of junction for use on the Rio Pungal Development of the Braden Copper Company, in Chile. This was destined to be used under a 900 ft. working head.



Here is how the hammer-forge welded pipe is first started in its process of manufacture. This illustration is similar to the twin pressure pipe line at the Rush Creek Power Plant of the Southern Sierras Power Company which operates under a head of 1800 feet.

modes of packing, effects of climate on goods, transportation, customs duties, foreign credits, and similar items. Thus the business library is prepared to select, arrange and put into form for ready use, information ranging from methods of rock tunneling, to the consideration of the advisability of putting a new commercial fertilizer on the market.

The Possibilities for Service

"The Americas," published by the National City Bank, New York City, contains in its December 1917 issue, an article entitled, "One Feature of German Organization in Engineering and Foreign Business,"



A BUSINESS LIBRARY

The reading room of the library of the National Bank of Commerce, New York City, in use.

the contents of which bear directly upon the importance of information as an indispensable asset in the prosecution of successful business.

The article states that industrial corporations in Germany before the war employed an officer called an Economic Director, who, "in the plan of organization of his company, is attached to the office of the President, or is an appendage of the Board of Directors. He has to organize complete information from various sources, and his authority is sufficient to organize this well. He obtains statistical information, foreign and domestic newspapers and periodicals, and the output of various bureaus of news is regularly received by him.

"His business is to keep his Executive informed on the instant of every development in many parts of the world that will mean a change of cost of production or a change in demand for the company's products. He must know what is going on in the regions where the company's manufacturing materials originate. He must keep his eye upon conditions affecting production, price and transportation. He must not miss any new source of supply, or any coming diminution of old sources. On the other hand, he must follow every development, political, social or economic that means an increase or a falling-off in the demand for particular kinds of machinery. If there is anything doing anywhere that is significant of a call for more sugar machinery, or a drop in the demand for textile machinery, in this particular man's business, he must judge its full value and advise his board of it.

"It is said of a man who was economic adviser to a German corporation that manufactured materials for railway construction and equipment that he had not only organized his supplies of information of what was going on over the world so that he reported to his board every tender for supplies from every part of the world, but he was expected to analyze general developments everywhere so thoroughly, as to predict in advance the regions where new railways would soon be built, or extensions made. His work, it is said, frequently resulted in his company's bringing about, in direct or indirect ways, the promotion of the new transportation enter-

prises he predicted. It is now believed that this idea of definite organization of economic information and intelligence has been carried out in order to apply to the after-war business situation by Germany."

The American Business Library is a step in the direction of helping to do for American business what this "German Economic Director" was doing for business in Germany and it is more than time that American business interests use the business library to its utmost capacity.

The Library and the Publicity Department

One of the important departments in modern business organizations served by the business library, is the publicity department which is the outcome of the recognition of the dependence of any business upon the public's understanding and appreciation of what it has to offer, in order to successfully carry on its work, whether that be a manufactured product



PAMPHLETS AND PAPERS

A section of the shelves of the library of the National Safety Council of Chicago, Ill.—Note the use of the clearly marked filing boxes for papers.

or the service of a public utility. In this day of economic investigation and criticism, it is vital to success that industries exploit their work and products clearly and logically, not only as a means of advertising but also to win and hold that all-important asset known as public good-will.

The publicity department strives to make the public understand the organization and its work and has charge of preparing direct advertising, for daily papers and periodicals, and in many utility corporations prepares copy for the financing and marketing of securities.

A live publicity department cannot do its work without ample library resources as its needs are encyclopaedic, for it is constantly preparing copy which calls for the most accurate and comprehensive data and it must keep up to date on what is currently issued in the lines of business in which it is particularly interested. Library service is so indispensable in publicity work that in a number of cases the library has been organized in the business house as a part of the work of the publicity department.

Assisting the Executive

The business library is also a great service to executives because the heads of business organizations today are concerned not only with the particular business of their own office, but with many economic and public affairs for the betterment of the community and the nation. The work of the modern business man, as expressed by a recent technical periodical, "because of the constant multiplication of problems to be settled and the great number of regulating agencies, is steadily growing more important. The successful business man must be a thinker and a man of affairs; he appears before Congressional committees and before state and federal com-



A GENERAL LIBRARY

One end of the general library of industrial literature maintained by the B. F. Goodrich Company

missions; he must know whereof he speaks, and he must know principles as well as facts, history as well as present conditions." In the midst of varied and large responsibilities, he knows he can not depend upon his own personal reading and study to keep all the important facts and figures which he needs at his finger tips, for the successful executive must not burden himself with too much detail.

He therefore turns to his librarian, who knows his personal point of view and his needs, and who is as necessary to him as his secretary. Sometimes the head of a business organization appeals to an assistant officer to give him the data he requires, and the assistant officer turns to another one, and he in turn goes to the library; the fact remains that sooner or later the request comes down the line to the librarian.

Making the Best Use of the Library

There are several types of men with whom the business librarian has to deal in doing research on business problems. One type of man who uses the business library is the one who comes in occasionally and browses among the books without communicating to the librarian in charge what subject matter he is looking for. This type of man does not purposely mean to be secretive, but he does not know how to use the service of the library and the librarian which are at his disposal. Often he turns away from his perusal of an encyclopaedia with a disappointed look, and in one case when the librarian asked what he was looking for, replied that he was trying to find the address of Mills College but that it did not seem

to be in the Encyclopaedia Britannica. Had he told the librarian at the start what he wanted, the address could have been given him from another reference book in about one minute's time.

Another type of man with whom the business librarian has to deal, is the one who conceals his specific object when he asks for information, and



A SPECIAL LIBRARY

Besides the general library shown above, the Goodrich Company maintains a special technical library for the chemical laboratories, one corner of which is here shown.

does not therefore make it possible for the librarian to procure the information desired in its most simple and direct form. For example, an engineer once asked for descriptive periodical articles dealing with the construction and equipment of large hotels. The librarian, of course, thought that what he had in mind was to make a study of the equipment, whereas all he wanted to get out of these articles was the names of firms who had installed certain mechanical devices. This information could have been collected much more quickly than in the time it took for the librarian to make a complete list of satisfactory descriptions of the kinds of buildings for which he asked.

The type of man who uses the business library most effectively is the one who takes his librarian into full confidence as to what he is doing, and what he wants to do, and gives the librarian not only the opportunity to produce what he has asked for, but also to make helpful suggestions as to material which he possibly has not thought of, in connection with his problem. The business man who thus directs and uses his trained librarian and his specialized collection gets the service which counts and has annexed an indispensable asset to the earning power of his organization.

What do you do with your copy of the Journal of Electricity? Do the manufacturer's catalogs which come to your place of business knock about in the dust and eventually get lost? Watch for the article on handling trade publications which will appear in the May 15th number of this series.

The Technique of Arc Welding

BY F. A. ANDERSON

(Much of the success of arc welding is dependent on the skill of the operator. The various elements involved, good practice under given conditions and what not to do under others is here discussed authoritatively by a man whose work as electrical inspector with the U. S. Shipping Board, both in the East and on the Pacific Coast, brought him into touch with every phase of the work.—The Editor.)

In a previous paper have been shown the methods and machines by which the proper current is produced for electric arc welding. This apparatus permits of adjustment in sufficient range to meet the usual requirements in practice, which provides a capacity of about 150 amperes for each operator.

There are sometimes conditions which require a capacity in excess of this amount, and in such cases it is customary to make provision to meet the demand. The successful operator should be able to adjust his apparatus to meet the conditions of the work. The machines are capable of such adjustment and are not to be blamed if it is not obtained.

There are two terms which are generally familiar in the arc welding profession, but they may be unknown to some—"Parent Metal" and "Electrode."

"Parent Metal" is a term used to denote the metal to be welded.

"Electrode" is the term used to denote the metal added in the process. This metal is however referred to by some as welding wire, welding rods, welding material, etc., while some contractions have been made for trade name purposes. Remember, the term "electrode" in arc welding is an adaption, for an electrode is either terminal of an electrical source, and may be of any electrical conducting substance. It is from the fact that in metallic electrode welding, a current is passed through the welding material, that it became known as the "electrode."

Nature of Arc Welding

Metals to be welded must be brought to a molten or fluid state. In arc welding this is accomplished by the electric arc, which produces an intense heat the moment the arc is "struck," but it is possible when striking an arc with a small electrode on a large or heavy piece of parent metal to completely melt the electrode before the parent is melted. In such instances the molten electrode is deposited on,

but not united with the parent metal. The operator must so adjust his arc that the parent metal will become molten at the same instant as his electrode, so that a perfect union of the two is accomplished—and he must continuously maintain this union. It has been thought that the non-ferrous metals could not be arc welded, but quite a number of them have been successfully welded by this process.

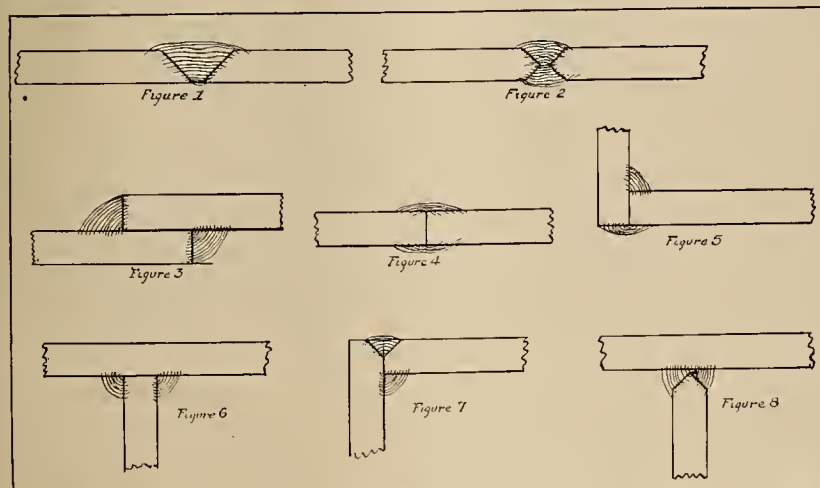
Adjusting the Current

Heat is the agent used for the reduction and combinations of metals into their finished and commercial state, and the electrode arc in the welding process serves only to produce the heat which man must adjust and control to accomplish this purpose.

It is found in practice that electrodes of different metals require different adjustment of the current supply, or different volumes of heat. The metallic arc is estimated to be from 3600° to 4000° F., the volume of this heat depending on the flow of current through the arc. It will therefore be apparent that should too much heat be present, an adjustment should be made to give a lesser supply of current, or vice versa, a greater supply for more heat.

Take for example a 5/32 mild steel electrode. This is a very popular size in common use, and there are many grades on the market. The current required for successfully welding with these varies from 100 to 150 amperes.

Now it must not be understood that the electrode is the only condition to be considered in the heat adjustment, for the parent metal is equally as important and presents as many varying conditions. It is however possible to compensate between the two and a very good practical way to determine the adjustment is to strike an arc adjacent to the place to be welded and see that the proper adjustment has been made for the successful combination of the metals into a homogeneous union.



Several of the typical methods of preparation.—Fig. 1 is a single V, beveled on one side. Fig. 2—a double V, beveled on two sides. Fig. 3—a lap weld. Figs. 4, 5 and 6—a straight, an angle and a tee butt joint weld. Figs. 7 and 8 show a more satisfactory arrangement of work. In all but the straight butt joint weld, the welding is done in an angle of about 90°.

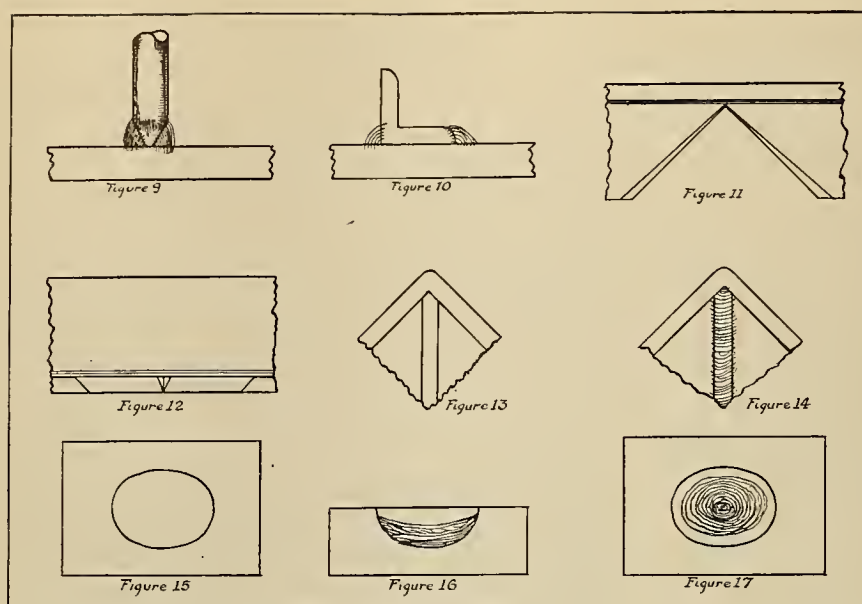


Fig. 9 shows a method of welding a stud to a plate, Fig. 10—an angle welded to a plate. Figs. 11, 12, 13 and 14 show a method of welding the corner of an angle. The usual 90° angle is cut from one leg (Fig. 11) and beveled about 45° (Fig. 12). It is then heated and bent (Fig. 13) and welded (Fig. 14). Figs. 15 to 17 show a method of filling a hole.

Methods of Work

The welder must be able to prepare his work or to know how to proceed after the work has been prepared for him. Some of the typical methods of preparation are here shown. Figure 1 is a single V or work, beveled on one side. Figure 2, a double V or work beveled on both sides. Note in both instances the two pieces do not touch; this is the best arrangement but not absolutely necessary, for occasion often arises where it cannot be obtained. Figure 3 shows a lap weld. Figures 4, 5 and 6 show, respectively, a straight, an angle and a tee butt joint weld. The term "butt joint weld" is used to distinguish this type of weld from the "butt weld" which is one of the principal processes of resistance welding.

When it is possible to arrange the work as shown in Figures 7 and 8, a more satisfactory result is obtained.

Figure 9 shows a method of welding a stud to a plate while Figure 10 shows an angle welded to a plate.

Figures 11, 12, 13 and 14 show a method of welding the corner of an angle, in the sequence of the operation; first, in Figure 11, the usual 90° angle is cut from one leg and beveled about 45° as shown in Figure 12, then heated and bent in the manner shown in Figure 13, and welded as shown in Figure 14.

A method of filling a hole is next shown, Figure 15 representing a plan view of the hole to be filled, Figure 16 showing a section through the hole, partly filled with the welded material, which shows the welding material carried continuously across the hole while Figure 17 shows a plan view of the welding also carried around the hole over its entire area.

In all the accompanying illustrations except the straight "butt joint weld" and filled hole, the welding is done in an angle of about 90°. Do not try to "lay a bead" parallel to the line of V and do not carry a bead up one side and down the other, but first build a bridge across the whole V beginning at the bottom and working up to the top all the way from side to side, Figure 18, until the whole V is filled at one

point as in Figure 19. This bridge should be on an angle from top to bottom—Figure 20—and should be gradually worked into a shape like that shown in Figure 21, the lowest point being toward the operator. In other words, the best results are obtained by working the metal upwards and continuously maintaining a circular motion of the electrode, being sure at all times to keep both the parent metal and the electrode in a molten condition. The circular motion helps to puddle the two into a closer union and also serves to equalize and distribute the heat on the parent metal. The rapidity of the work depends on the thickness or weight of the parent metal; the lighter the metal the more rapidly must the operator work, and the heat must be such as to successfully weld without destroying the parent metal.

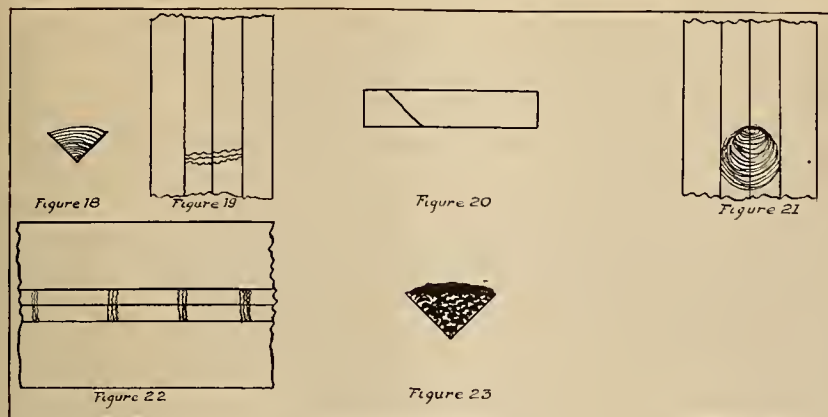
In long welds it is advisable to make various "tack" welds or bridges across the V as shown in Figure 22; these should be thoroughly worked into the weld as the work progresses and includes them.

Various other methods might be described but I believe the foregoing will serve to show that any weld may be accomplished by the proper application of engineering skill and ability.

Faults of Adjustment

There are many faults common to the operator which are to a great extent responsible for the disfavor with which arc welding is sometimes viewed. So often we find an operator using too high an amperage, with the result that his arc is too hot—his metal burned, presenting a spongy or porous appearance, in which case its strength is greatly reduced and large quantities of it have not united with the parent metal. This last is due in part to the fact that molten metal precedes the arc and serves to prevent the parent metal from melting, the arc being drawn from the overlapping molten electrode and not directly from the parent metal.

Another fault is too low a value in volts and amperes. Here the result is often "metal deposited on but not united with" the parent metal. This often results in the V-ed out portion being filled to



The method of filling a V is illustrated by Figs. 18, 19, 20 and 21, which show the method of beginning at the bottom and filling in the V, the plan view, the angle at which the bridge should be made and the general shape of the work. In long welds, several bridges or "tack" welds are made (Fig. 22). Fig. 23 illustrates the texture of weld obtained through too low a voltage and amperage. Note the mushroom-shaped granules.

about four-fifths its area with simply deposited metal and only the top portion being thoroughly united and welded. Specimens of this type of work which have been broken for examination have showed that the electrode has been deposited in a manner resembling mushrooms, the center uniting with the parent metal while a large part of the molten metal falls over and resembles the top of the mushroom, as in Figure 23, and the weld would be full of such mushrooms. In this instance the speed of the operator is partly responsible for the defect, while his failure to move his electrode in a circular or oscillating motion has added to the fault.

Detecting Faults

With colored glass in shades properly arranged to neutralize the arc's rays it is possible to detect a number of these faults during the operation, and it is also possible to see whether or no the parent metal is being brought to the proper molten state and that the desired union is being accomplished. Practice and experience will also enable an operator, by means of these glasses, to thus determine that his heat is properly adjusted.

The detection of faulty welds after the work is completed is difficult except by severe tests, and for this reason the conscientious application of the operator must be, more than in any other case, relied upon. I want here to add both a caution and some little advice to the operator or the man who would become one. It is a well known quotation and one worthy of the adoption of any man, but particularly to those engaged in this most interesting profession: "To thine own self be true, and it will follow as the night the day, thou canst not then be false to any man."

Generally the work is made positive and the electrode negative, but conditions often arise when better results may be obtained by the reversal of polarity. In over-heat work better results seem to be obtained with the electrode positive and the work negative; and the same sometimes applies on light metal.

The length of arc, or the distance between electrode and parent metal must also be adjusted for various conditions and in the over-heat work the short arc produces more satisfactory results.

These are all adjustments which the operator must make, and his ability to make them must be gained by experience. It is the "human factor" in the equation of arc welding; it embraces the steadiness of the operator's hand, his judgment in determining conditions, his aptitude for ready and rapid adjustment, and his application to his work.

Tools Required

The tools required are few and they are simple in design, many operators preferring to devise their own, which practice has produced a number of unique results.

First comes the electrode holder which, as its name implies, is a device for holding the electrode. It must provide means of securely holding the electrode and supply an ample current capacity, with proper arrangement for the attachment of the lead or wire for the welding machine and an insulating handle, or grip, for the operator. Some form of shield for protecting the hand from heat and flying particles of metal adds to the success and usefulness of the device.

Next is the shield for protecting the face and eyes from glare and heat. These vary in design from a plain piece of board in the shape of a paddle with the colored glass held in place by wedges to elaborate affairs with hinged windows and various other arrangements designed for the convenience of the operator. Most important is the colored glass which must include red and blue, and in sufficient density to neutralize the arc's glare; the addition of green sometimes softens the glare to a very comforting degree. A good plan is to use a piece of ordinary clear glass next to the arc which increases the life of the more expensive glass, as flying particles of metal adhere to the glass and soon destroy its usefulness.

A wire brush should be provided for removing dirt and the accumulation of oxide from the work, while an ordinary machinist's hammer and cold chisel prove themselves useful. Gloves to protect the operator's hands add to his efficiency and are almost indispensable.

The next article will discuss "electrodes" and their relation to the "parent metal."

PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(Educating the customer so that he is no longer mystified by electricity—and therefore no longer suspicious of the company which supplies it, is one of the best ways of dealing with "The Man in the Street," according to an article appearing elsewhere in this issue. The San Joaquin Light & Power Corporation is sending out notices of this course to its customers and urging their taking it—Why not take advantage of this idea? Supplementary matter is supplied to those taking the course by the extension division of the Universities of California and Oregon. Back numbers of the earlier articles of this series will be furnished those beginning now.—The Editor.)

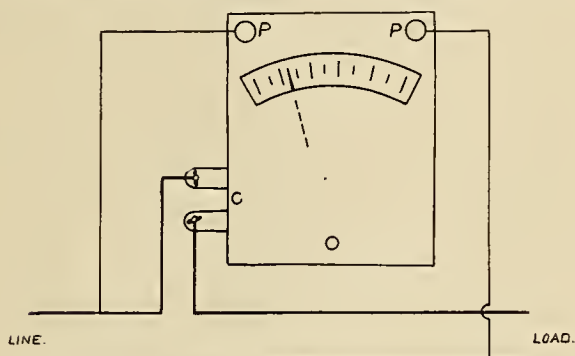
ELECTROMAGNETS—TRANSFORMATION OF ENERGY

A soft iron bar with a coil of wire around it becomes a magnet when current flows through the wire. The magnetism disappears when the current stops, so that whatever had been picked up now falls away. A similar "electromagnet" may be made without any iron, but the pull it exerts is far less.

Magnetic effects are explained on the theory that an electromagnet or a permanent steel magnet produces "lines of force" which issue from one end

(as by floating it upon a cork or balancing it upon a pivot), this end turns toward the north. The force lines (often called "magnetic flux") enter the magnet at the "south pole," after passing through the air or any iron or steel objects in the neighborhood.

Magnetic flux runs through all substances, but far more easily through iron and steel than any other material. Thus a current flowing in a simple



The wattmeter reading depends upon both voltage and current.—Figure 1.

or "pole" and return to the other end, and then pass through the instrument itself. Thus each line of force is a complete, closed curve.

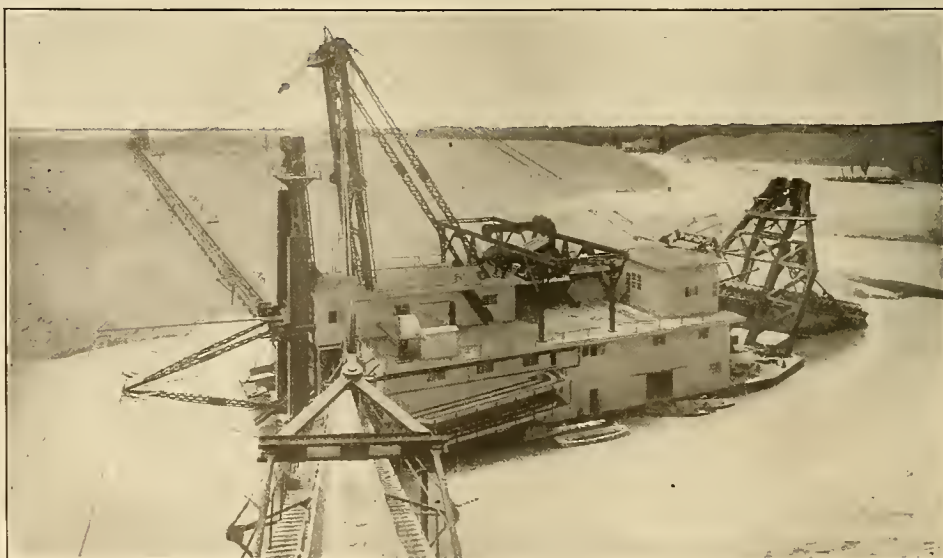
The end of the magnet out of which the lines come is called the "north pole" for it is found that, whenever it is so supported as to be free to turn



This heater has a resistance of 27.5 ohms. What current does it take on a 110 volt circuit? How many watts of power? How many kw.? How many electrical horse power?

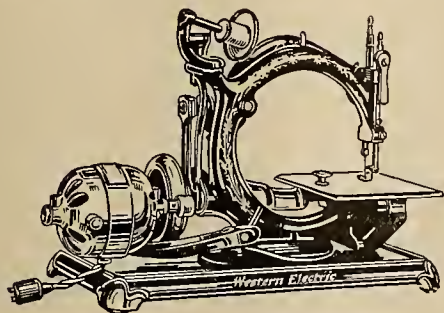
coil produces lines of force, but with an iron core in the coil many more lines are found. And if an iron path is provided for the lines outside the magnet, so they do not have to go through any other material,

This is the largest gold dredge in the world. It is located near Hamonton, California, and is electrically operated throughout, with its chain of 18 cu. ft. buckets handling 15,000 cubic yards of gravel a day at a cost of only three cents per cu. yd. What horse power is required to move the gravel up the "bucket ladder" in this gold dredge when the pull up the slope is 20,000 lbs. and the speed 15 feet per second?



a large flux can be produced with a small current. Hence, electromagnets are often made in the shape of a horseshoe, and iron paths are provided for the external flux in such electromagnetic machines as generators and motors.

The amount of flux produced by a magnet depends upon the number of turns in the coil and upon the current, as well as upon the material the lines traverse. It is found that 8 amperes through 20 turns give exactly the same flux as 40 amperes



Among the many household uses for electric energy, one of the most convenient is illustrated here. With a certain piece of sewing in the machine the motor was found to take a current of 4 amperes, while a watt meter (connected as in Fig. 1) read .12 kw. What was the voltage of the d.c. circuit which supplied the current?

through 4 turns. In other words, the product of amperes \times turns (which is called the "ampere-turns") determines the tendency to produce flux, while the number of lines actually set up depends also upon the nature of the magnetic path.

Ammeters.—Applications of electromagnetism are found in the ammeters used for measuring currents on switchboards and elsewhere. One type is illustrated in Fig. 1, which shows the d'Arsonval movement found in one type of ammeter. When the current to be measured flows around the coil attached to the pointer, the coil becomes a magnet with each face one pole. These are attracted to the opposite sides of the permanent steel magnet constituting the frame, which causes the coil to turn against the restraint of springs. If the current increases, the turning effort becomes stronger, so that the pointer is carried farther along the scale.

The Kilowatt Hour.—If a man uses 3 kw. for four hours he makes only half as much demand on the power company as if he used 3 kw. for eight hours, and he gets only half as much work done by his motor. In one case he uses 4×3 or 12 "kilowatt-hours" of electrical energy, and in the other case 8×3 or 24 kw-hr. The cost of electric service depends on **both** the power **and** the time; the usual custom is to base the charge on the "kilowatt-hour," which is the energy supplied in one hour by one kw. The retail price of one kw-hr. varies from one to 5 cents for heating, cooking and motors, and from 6 to 15 cents for lighting. Energy is sometimes sold by the horsepower-hour ($\frac{3}{4}$ of a kw-hr.), and sometimes by the horsepower-year (especially for pump-irrigation water).

At 6 cents per kw-hr. \$1.80 will buy 30 kw-hr. The power may be 30 kw. for 1 hour; or 10 kw. for 3 hours; or 6 kw. for 5 hours; or $\frac{1}{2}$ kw. for 60 hours; or 4 kw. for 3 hours and 9 kw. for 2 hours. Evidently a statement of a number of kw-hr. does not tell anything at all about the number of kw. (or

power). Instruments that measure kw-hr. are not "watt-meters" but "watt-hour meters."

If you know the kw-hr. and the number of hours, you can find the average kw. In the example above, if it is given that the 30 kw-hr. are used in 5 hours we can say that the average power is 6 kw.—but it may be 4 kw. for 3 hours and 9 for 2 hours. Note the particular meaning of the word "average" here; average = number of kw-hr. divided by the number of hours.

Heat Energy.—It has been found by numerous careful experiments that when one kw-hr. of electrical energy is used up in overcoming "electrical friction" or resistance, a certain definite amount of heat is developed, namely, enough to heat 3,412 pounds of water one degree hotter (by Fahrenheit thermometer). This is generally expressed by saying that 1 kw-hr. = 3,412 "British Thermal Units" or 3,412 B.t.u. Also when one kw-hr. of mechanical energy ($1\frac{1}{3}$ h.p. hours) is used up in overcoming friction 3,412 B.t.u. of heat is developed. One horsepower-hour similarly gives 2545 B.t.u.

In a steam or gas engine it is possible to measure the heat developed by the fuel and the heat wasted in the exhaust, radiation, etc. The loss of heat is always less than the heat developed, the difference being a certain definite number of B.t.u. in each case. It is found that this difference, divided by 2545, gives the number of h.p. hours of mechanical energy developed. Or, the "useful" B.t.u. divided by 3,412 = the number of mechanical kw-hr. Thus it is proved that 3,412 B.t.u. can be changed to 1 kw-hr., or 1 kw-hr. can be changed to 3,412 B.t.u. Mechanical energy, electrical energy, and heat are simply three forms of the same thing; by various devices we can make energy take any form desired.

Efficiency of Transformation.—In many transformations of energy, there is a "loss" of some of the energy—loss in the sense that the energy changes into some form that is not desired, or goes to some place where it is not wanted. For example, in a motor we wish electrical energy to be converted to mechanical, but inevitably some energy goes into heat through friction, resistance in the wires, etc. If the motor has an efficiency of 80%, 20% of the electrical input is expended in undesired ways. Similarly, in an electric water heater we desire the conversion of the electrical energy into heat in the water, but some heat is sure to escape to the surrounding air, material of the container, etc. The efficiency of such a device = useful B.t.u. \div total B.t.u. produced from the electrical energy; or eff. = useful B.t.u. \div $3,412 \times$ kw-hr. expended. On the other hand, an electric air heater in a room has perfect or 100% efficiency, for all the heat must get into the air and objects where it is wanted.

Engines which are used for the purpose of converting heat into mechanical energy are comparatively inefficient. A large part of the heat given to them is sent out again as heat and not as work. Most of it goes out through the exhaust, but in many cases (as in gas engines) a large part of the heat is passed out through the cylinder walls to the cooling water. The efficiency of steam and gas engines in practice varies from 10% to 30%.

Nationalizing the Cooperative Campaign Movement

(A "Bureau of Education and Research" is planned by the National Association of Electrical Contractors and Dealers to carry out a campaign throughout the nation to educate the electrical contractor and dealer and to improve generally conditions of merchandising. The plan is of such far-reaching importance that its details as here given should be carefully studied by every man in the electrical industry. You are going to be called upon to support this.—Do you know about it?—The Editor.)

Objects.—To collect from all sources, information relative to the best methods of improving and increasing retail distribution.

To place this information before the industry in various localities, and through local effort to urge all those now engaged in the retailing of electrical material to increase their efforts and to conduct their business along economical and efficient lines, and to endeavor especially to get contractor-dealers who are not retailing to develop this branch of the business, to the end that retail distribution will be increased and the contractor-dealer will be placed on a more stable basis.

To give retailers through printed matter and personal visits, the information which they evidently need to enable them to conduct their business on recognized business lines.

Method of Operation.—The work of the Bureau is to be carried out by obtaining in the various localities throughout the country cooperation between the manufacturers, jobbers, central stations, and retailers, so that all branches will be working together to increase the retail distribution of electrical material.

The preparatory work to be done through suitable printed matter, laying out the aims and objects of the work, and what is necessary to accomplish the results.

This to be followed by personal field work done in the various localities, which primarily will be the purpose of getting together the parties interested and directing their efforts toward the results desired, so that all sections of the country will be working to accomplish the same end.

The foregoing work to be supplemented by a series of lectures on the following subjects, each lecture being written by specialists in the line treated, such as

Management	Estimating
Selling	and
Accounting	Installing

These lectures will be prepared complete by the Bureau in such form that they can be furnished to any locality, but the entire arrangement for and delivery of the lectures to be under local supervision and at properly advertised open meetings.

The recent lectures on Cost Accounting and Estimating have demonstrated the need and value of such lectures.

Where the circumstances do not warrant the delivering of the lectures, the subject matter will be furnished in printed form to the retailers in such territory.

Field Work.—The work of the field men for the Bureau will consist of calling on the various interests in the electrical industry in different localities for the purpose of getting them to work together on a broad cooperative plan to improve the distribution of electrical material in their territory.

The field men will also be prepared to show the retailer when requested, how to improve his store; how to improve his business methods along economic lines; how to install and carry on proper cost accounting and bookkeeping systems; and to take up any subject on which assistance is requested.

Financing.—While it is felt to be necessary that this work be carried on by the retailers organization, it is recognized that the retailers are not in a position to finance this educational work at the present time, unaided, and for this reason, financial support is asked from manufacturers, jobbers, central stations, and others interested in obtaining the results outlined.

As subscribers will be directly benefited by the increased sale of resale material and current consuming devices which will be produced by the work of the Bureau, they are asked to subscribe on a yearly basis, a sum approximately equal to 25 cents on each thousand dollars' worth of sales of such resale material, or in the case of the central station, the sale of current, with a minimum subscription of \$50.00 per year, and a maximum subscription of \$10,000 per year, excluding sales of material for export and any sales to governmental or state departments. The amount of the individual subscriptions will not be made public.

The money contributed to the support of the Bureau will be expended by and through the National Association of Electrical Contractors and Dealers with the understanding that part of the expenditures will be for general work in the different localities in proportion to their numerical membership in the National Association; resulting in each locality receiving benefits from the work in proportion to the activity and interest shown by those concerned in the industry in such locality.

Privileges and Responsibilities of Subscribers.—All subscribers to the Bureau of Education and Research will be accorded all the privileges of Associate Members of the National Association of Electrical Contractors and Dealers; that is, the right to attend meetings and participate in all discussions, and to receive data and information, it being distinctly understood that subscribers exercising any or all of these privileges do not in any way take on the characteristics of membership or assume any liability for any of the acts of the Association.

A list of subscribers, without naming amount subscribed, will be distributed, and the representatives of subscribers will be welcomed at all meetings of the National Association or of any of its branches.

Advisory Committee.—There will be an Advisory Committee consisting of representatives from each branch of the electrical industry; namely, the manufacturers, the central stations, the jobbers, the engineers, and the electrical press, to be selected through consultation with the subscribers from each branch. Matters of policy will be passed on by this Advisory Committee before being finally acted on by the managing committee.

Management.—The management of the Bureau will be under the direct control of a committee of three members of the National Association of Electrical Contractors and Dealers, the national chairman being a member and the chairman of this committee.

Results to be Obtained.—It will be seen that the work of the Bureau is primarily devoted to the education of the contractor and retailer, so that they will appreciate the importance of actively increasing the retail distribution of all kinds of electrical materials, and improving their business methods.

The work will further result in the stabilizing of the contracting business of the country by inducing contractors to operate retail stores requiring a fixed permanent investment in their business.

The increase in the number of retail stores, the education of the retailer to properly handle appliances, and the necessity of suitable wiring for the use of appliances, must

of necessity increase the sales of materials, and through the sale of current consuming devices increase largely the use of current.

Use of Funds.—It should be especially noted that the funds of the Bureau are not to be applied to regular work of the National Association (which in the year 1918 cost

approximately thirty-five thousand dollars, and is on a self-sustaining basis); the benefit to the National Association arises from the improvement in the general business conditions of the electrical contractor-dealer, and the increase in membership, which will tend of itself to improve, increase, and stabilize distribution.

California Electrical Cooperative Campaign Notes

Standard Accounting Practice for Dealers and Contractors.—The special committee of auditors appointed for the purpose have made their report to the Advisory Committee, outlining the best method of adapting the Standard Accounting System of the National Association of Contractors and Dealers in California. It is expected that the Advisory Committee will adopt this report at their meeting in Coronado, April 29th. The field representatives will then be instructed by the Special Accounting Committee and will be ready after about May 12th to assist contractor-dealers to adopt this desirable accounting system for their individual businesses.

The Sub-Committee on Advertising has been reorganized and now includes A. W. Childs, chairman, A. E. Wishon and M. L. Scobey. They are preparing advertising copy to be used by the central stations during the next several months. This is being worked out on a definite schedule designed to make each advertisement appear at the proper time to do the most good. They are receiving valuable assistance from the advertising departments of some of the manufacturer, jobber and central station contributors. From the very first when this advertising work was started last September, the committee has had the active assistance of I. W. Alexander, an experienced advertising and publicity man, who is associated with A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation. Mr. Alexander has prepared most of the advertising material so far used in the campaign work and his handiwork will undoubtedly be seen in much that will appear in the future. The Advisory Committee appreciates this valuable contribution to the work of the campaign.

The Advisory Committee has endorsed the correspondence course in electricity which has been made available by the Extension Division of the University of California working in conjunction with the Journal of Electricity. The Advisory Committee believes that a study of the subject of electricity as given in this course will enable many men and women employed in the electrical industry in this state to do better work and therefore give better service to the public. As this will help build up and improve the electrical industry, the Advisory Committee has sent a letter to all contractor-dealers and other campaign contributors, calling their attention to this desirable course of study and urging each one to give it the broadest publicity within his respective organization. The field representatives have also been requested to recommend the course in their travels about the state.

On December 31, 1918, the Campaign Fund contained \$4300. There has since been added contributions amounting to \$14,110, making a total of \$18,410 available for the work during 1919. In addition to the approximately 200 contractor-dealers represented by the contribution of the California Association of Electrical Contractors and Dealers there are 45 contributors to the fund including nearly all of the leading and representative central stations, jobbers and manufacturers. The Advisory Committee plans will enable them to use to advantage a few more contributions. If anyone who is not now on the list is willing or desires to be, they may see or write D. E. Harris of the Pacific States Electric Company, San Francisco, and tell him how much they will contribute to help along this good work. A full list of the contributors will be issued May 5th for publication and will appear in the May 15th issue of the Journal of Electricity.

The plan for a Solicitor Staff Service to dealers outlined in the Advisory Committee's annual report has met with a very hearty response from the contractor-dealers of the state. The Advisory Committee is endeavoring to act as an employment and booking agency whereby dealers may employ best grade house solicitors for a short period of time and on a commission basis. Up to date there has been a greater demand from dealers for solicitors than the committee has been able to supply. L. H. Newbert, 445 Sutter street, San Francisco, and A. M. Childs, Southern California Edison Company, Los Angeles, will be glad to receive applications for steady employment from high grade solicitors.

Because the California Association of Electrical Contractors and Dealers desired to use more of the time of their secretary, J. W. Redpath, for promotion work, he has been relieved of the secretarial duties of the Advisory Committee. R. M. Alvord, a member of the Advisory Committee, now acts as secretary at the committee meetings and supervises the secretarial work at the office. Miss Marion E. Towson has been appointed assistant secretary and is in charge of the committee's work at the office, 505 Rialto Building, San Francisco.

A. L. Spring, field representative in the South, has recently assisted the dealers of Los Angeles in planning and starting a special house-wiring campaign. The following notes from Mr. Spring's report show how the Cooperative Campaign has been a material help to the contractors.:

Mr. L. E. Moselle, of the Bureau of Power and Light of the city of Los Angeles, advised Mr. Arbogast on April 2nd that his department had a list of occupants and addresses of one thousand unwired residences in the southeastern section of the city, which list they would turn over to the Contractor-Dealers' Association if action would be taken on it. Mr. Arbogast asked me to meet with Mr. Moselle and talk over this matter and plan a Cooperative House Wiring Campaign. Mr. Moselle and I discussed the matter in detail that afternoon and in order to have information as to the class of prospects, class of buildings, locations, etc., I made an appointment with him to look over the district and investigate conditions Friday morning. The full morning was spent getting the desired facts and further planning the campaign, and Mr. Moselle advised at that time that they were also compiling a list of unwired houses in the balance of the territory they cover in the northeastern section of the city which will add at least another thousand to their list. We were all surprised to find so many unwired houses in this city. With over two thousand in the territory covered by the Bureau of Power and Light, there must be in the entire city six or eight thousand.

I attended the Contractor-Dealers' Association meeting Friday evening and gave them complete information and told them of the plans for a House Wiring Campaign. These were well received and they agreed to give the campaign their best support.

On Saturday morning I met with Mr. Moselle and Mr. Moody, the Business Agent, and told them how the contractor-dealers took the plan and what they would do to make it a success. At this meeting further details were decided upon, and by carrying out the plans formulated, this campaign should be comprehensive and productive of results. The campaign will be launched in about two weeks and it is hoped that it will be so successful that we can profit by the experience gained in it by conducting similar co-operative campaigns in territories of other central stations. A complete outline and story of this campaign will be published later.

The Advisory Committee conducting the California Cooperative Campaign some time ago reached the conclusion that its work could be made more effective if it were possible to really obtain the enthusiastic assistance and support of the many electrical salesmen operating in California. It was therefore determined to organize a "Salesmen's Auxiliary," such auxiliary to cooperate actively with the Advisory Board in such campaign work as might be delegated to it.

Owing to the press of other matters the organization of the auxiliary has been somewhat delayed, and they are now desirous of making the plan effective at as early a date as possible. The committee is therefore at this time soliciting the names of traveling salesmen.

SPARKS—Current Facts, Figures and Fancy

(Did you know that Japanese cannot be aviators? That rent in some parts of Russia is as much as 15,000 rubles monthly? That chickens are picked by vacuum cleaner? The adoption of the service charge by a New York restaurant, the remarkable war record of gasoline production, a pole tax in Japan and other items of varied interest are presented in the following review of progress and curiosity.—The Editor.)

Picking chickens by vacuum cleaner is virtually the principle of a machine invented by a Buffalo man. The feathers of the fowl are sucked up against the two rollers and plucked by having to squeeze between the rollers, after which they are blown to a tank.

* * *

There were 54,345 post offices in the United States last year, according to the Post Office Department. The greatest number of post offices was 76,945, in 1901, the extension of the rural delivery since its establishment in 1896 having caused the reduction in the number. The number in 1790 was seventy-five.

* * *

The Japanese race is said to lack the sense of equilibrium necessary to make an aviator, owing to some difference in the construction of the inner ear. In consequence very few Japanese can operate an aeroplane—a fact which would have a very important bearing upon the part which Japan can take in aeroplane work.

* * *

An animated can opener is reported from Georgia in the shape of a "razor back hog" who was benefiting from the burning of a sweet potato cannery. Blackened cans were common in the ruins and the busy old sow had used both hoof and tooth to lay open the cans for the little pigs who immediately proceeded to bury themselves to the ears in the contents.

* * *

A pole tax (this is not a poll tax) has created some inconvenience to the power companies of Japan. The taxation on electric poles by local communities is, it appears, a common practice in some parts of Japan and an effort is now being made to have this tax prohibited as a serious interference with the development of the light and power industry—and hence of industry at large.

* * *

The telephone is taking a position as an instrumentality of justice. In a recent item appearing in the Ukiah (Cal.) Times it is recorded that a certain citizen of the county, accused of a violation of the game laws, was interrogated as to his guilt or innocence by the township justice over the long distance line. A plea of guilty was the answer and a court fine was imposed through the same agency.

* * *

In 1916, before the United States entered the war, the production of gasoline was a little short of fifty million barrels. In 1917, when war activity was accelerated by the entry of the United States into the war, the production of gasoline had increased to

nearly sixty-eight million barrels, an increase of more than fifty thousand barrels a day. In 1918 it reached eighty-five million barrels, an increase over 1917 of forty-seven thousand barrels a day.

* * *

Perhaps the most delicate technical instrument developed and in use during the entire war was the phonotelemeter, as used by the Allies. This instrument not only locates an enemy battery, but it gives the caliber of the gun as well. These remarkable results are obtained merely from the report of the gun. The operation of the instrument is chiefly electrical, and, surprising as it may seem, it is not affected by rifle fire. A single set covers a 5-mile front, and it is reported that one section located 117 guns or batteries in 24 hours.

* * *

An autopsy on an Esquimaux shows his lungs to be perfectly white. A similar survey of the interior of a dead adult who has resided long in a city where smoke and dust are common discloses lungs that range all the way from light mulatto to African blackness. The moral to this tale as pointed is that less coal should be burned by private enterprises—economizing both fuel and soot by establishing central power and heating stations. Electrification of railways, electric cooking in the home and other fields readily suggest themselves as important factors in cleaning the air.

* * *

While a few persons make enormous profits in South Russia, according to a Bureau of Commerce report, the masses suffer, a combination that inevitably breeds Bolshevism. The population has been increased to nearly 800,000 by refugees from Bolshevik Russia and is 30 per cent above normal. Single, unheated rooms, without board, rent for 1,000 to 2,000, and small apartments for 5,000 to 15,000 rubles monthly. The currency situation is rendered complex by reason of the common occurrence of counterfeit money and unauthorized notes.

* * *

While the demand charge is something with which electric utilities are familiar, it is gratifying to find that the logic of this basis is appreciated elsewhere. A New York restaurant has installed a demand charge of 32c to be added to each check, which covers, according to its menu, rent, fuel, light, general supervision, bookkeeping, food standardization, depreciation and return on investment. The remainder of a customer's check is made up of charges which cover the bare cost of the food itself. Such items are listed as—Coffee 2c; Buttered Toast 3c; Fried Eggs (2) 14c; Steak (8 oz.) 30c.

PERSONALS

Guy A. Richardson, general superintendent of operations of the Puget Sound Traction Light & Power Company, Seattle, has accepted the position of superintendent of transportation of the Philadelphia Rapid Transit Company and will leave shortly to take up his new duties. Less than 20 years ago Mr. Richardson was a motorman on the street railways of Boston and now is to have control of the operation of all the car lines in the third largest city in the United States. He came to Seattle in 1909 where he was made

assistant to the general superintendent in charge of the operations. In his new work Mr. Richardson will have charge of 700 miles of street railway, 4000 cars and between 7500 and 8000 employees. He will remain in Seattle for a short time to assist in turning the street car lines over to the city, then go east to take up his new work.

Lieut. Thomas Maddocks has been appointed state engineer of Arizona.

F. E. Newberry, of the F. E. Newberry Company of St. Louis, is a recent San Francisco visitor.

Charles P. Cotter, secretary of the Montana Railroad Commission, is a recent San Francisco visitor.

H. E. Hobson of the Southwest General Electric Company of Dallas, Texas, is a recent San Francisco visitor.

William G. Kirchhoff, president of the San Joaquin Light & Power Corporation, was a recent San Francisco visitor.

W. A. Brackenridge of Pasadena, president of the Southern California Edison Company, was a recent San Francisco visitor.

M. T. Dollman has recently been appointed advertising manager of the Pacific States Electric Company at San Francisco.

James R. Thompson, consulting engineer of Portland, Oregon, has recently been confined to his bed with a severe illness.

D. E. Wiseman, outside plant engineer with the Pacific Gas & Electric Company, has recently made a trip to New York City.

John R. Freeman, of Providence, the engineer who reported on the Hetch-Hetchy project for San Francisco, is a recent Pacific Coast visitor.

D. A. Munger of Los Angeles, traffic manager of the Pacific Electric Railway Company, from Los Angeles, has been visiting in San Francisco.

Allen H. Jackson of the law department of the General Electric Company, with headquarters at Schenectady, is expected on the Pacific Coast in the near future.

S. G. Down, president of the Associated Engineering & Supply Company of San Francisco, has been elected president of the Westinghouse Pacific Coast Air Brake Company.

W. W. Mumma, fan sales manager, Robbins & Myers Company, has been visiting the Pacific Coast and will attend the Coronado conventions before returning to Springfield.

Ed. T. Clark, formerly an electrical contractor at Sacramento and recently returned from France where he was gassed while serving as master electrician with the A. E. F., has joined the San Francisco district sales force of The Trumbull Electric Manufacturing Company.

Foster C. Gibson, resident manager of the Edison Storage Battery Supply Company with headquarters at Seattle, is a recent San Francisco visitor.

R. C. Libbey, representing Simplex Electric Heating Company, Cambridge, Mass., is spending some time on the Pacific Coast and is in attendance at the Coronado conventions.

E. B. Snyder of the high tension insulator department of the Ohio Brass Company of Mansfield, Ohio, recently spent some time in San Francisco previous to the Coronado convention.

R. St. J. McClelland, chief engineer of the Electric Bond and Share Company, with headquarters in New York, is a recent Pacific Coast visitor and is in attendance at the Coronado conventions.

L. A. S. Wood, district sales manager of the George Cutter Company of South Bend, Indiana, recently spent some time in San Francisco and is now attending the Pacific Coast Section N. E. L. A. convention in Coronado.

Geo. A. Hughes, president of the Edison Electric Appliance Company, Inc., with headquarters in Chicago, and Mrs. Hughes are recent California visitors, having motored up and down the state from San Diego to San Francisco.

F. N. Averill, of Fobes Supply Company, and O. B. Stubbs of the Stubbs Electric Company of Portland, Ore., recently passed through San Francisco on their way to the Coronado convention which they are now attending.

Norman G. Hardy has assumed the position of chief mechanical and electrical engineer for the Arizona Copper Company, Ltd., Clifton, Ariz. He was formerly associated with the Old Hickory Powder Plant, Jacksonville, Tenn.

C. D. Sloan, for eight years cashier of the Montana Life Insurance Company, Helena, and recently in government service, has joined the firm of Thompson & Castleton, electrical engineers and contractors, Seattle, and will have charge of the offices of the company.

Dr. Frank B. Jewett, chief engineer of the Western Electric Company and late lieutenant-colonel in the Signal Corps, U. S. A., has been awarded the Distinguished Service Medal. The official citation follows:

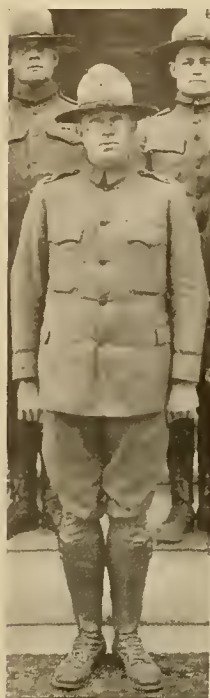
"Mr. Frank B. Jewett, late Lieut. Col., Signal Corps, for exceptionally meritorious and conspicuous service in connection with the development of the Radio Telephone and the development and production of other technical apparatus for the Army."

F. D. Fagan, Pacific Coast sales manager of the Edison Lamp Works, is chairman of the Land Show Committee of the

Home Industry League of California celebration scheduled to be held at the Civic Auditorium, San Francisco, from October 4th to 19th. The avowed purpose of the event is the exploitation by visualized demonstration, of the state's producing power, unlike anything else ever held here. The Land Show will be devoted exclusively to goods grown or manufactured in California, no other exhibits being accepted. Electricity will play an important role in this forthcoming Land Show. The directors of the event are determined upon bringing to the eyes and minds of the people the electrical development in California. The decorations will include many brilliant arrangements of light, and current will be furnished free to exhibitors for illumination. Motive power, which will be encouraged for machinery of various kinds, will be furnished at a nominal figure. Electricity will be utilized in every corner, and in addition to a marvelous flood of light from basement to dome, the arrangement will be made to serve the double purpose of decorative effects.



A. H. Griswold, who was only recently discharged from service as a lieutenant-colonel of engineers in charge of communications back of the trenches in the A. E. F., has again been summoned from San Francisco to France. This time, however, he goes as chief engineer for the installation of a large contract for the French Government recently undertaken by the American Telephone & Telegraph Company and the Western Electric Company.



C. O. Poole is chief engineer of the Southern Sierras Power Company and not of the Sierra & San Francisco Power Company, as erroneously stated in the article on Pacific Coast Practice in Insulator Testing in the Journal of Electricity, April 15, 1919, page 345. Also J. O. Case, who presented the excellent article entitled "How Can the Electrical Industry Assist the Architect?" is known as the Los Angeles manager of the supply department of the General Electric Company instead of the title as given on page 370 of the issue referred to.

C. B. McCullagh, head of the civil engineering department of the Oregon Agricultural College, has accepted the position of state highway bridge engineer of Oregon.

Arthur Arton Hamerschlag, one of the prominent educators in this country and president of Carnegie Institute of Technology, Pittsburgh, spent some days in San Francisco recently as part of a western trip.

George W. Milliken, manager of the La Junta division of the Arkansas Valley Railway, Light & Power Company, La Junta, Colo., has been appointed chairman of the Victory Liberty Loan campaign organization, which will conduct the drive in Otero county, Colorado.

Major J. F. Dillon of the United States signal corps has been placed in charge of the United States radio office at the Custom House, San Francisco. Major Dillon served with the signal corps of the 1st Artillery in France and was stationed before Verdun in November.

Julean Arnold, commercial attache of the U. S. Government at Peking and well known to the readers of the Journal of Electricity through his writings on West Coast trade with the Orient, has been offered the honorary degree of Doctor of Laws by St. John's University, Shanghai, China, in recognition of his untiring efforts for the cause of practical education and constructive reform in China.

W. R. Putnam, formerly commercial manager of the Utah Power & Light Company, becomes vice-president and general manager of the Idaho Power Company, with headquarters at Boise, effective May 1. Mr. Putnam will succeed W. T. Wallace who goes to New York. P. M. Parry, formerly division manager for the Utah Power & Light Company at Ogden, will succeed Mr. Putnam as commercial manager.

H. S. Lyons, who for two years prior to his entry into the aviation branch of the service had charge of the sales of C-H Push Button Specialties and Wiring Devices in the territory covered by the Chicago office of the C-H Company, has re-entered the employ of this company. Mr. Lyons is now engaged in sales work in the Cutler-Hammer Magnetic Shift Department.

Philip K. Condict, who has until recently been in government service, has been elected vice-president of the International Western Electric Company, Inc. Up to the summer

of 1917 Mr. Condict was foreign sales manager for the company, later being connected with the War Trade Board, the Quartermaster's Corps and the Signal Corps, with the rank of Major.

D. R. Bullen, manager supply department, General Electric Company, is attending the sales conference of the Pacific Coast district of the General Electric Company and is also in attendance at the Coronado conventions. A. D. Page, manager of the Edison Lamp Division of the General Electric Company, and G. C. Osborne, eastern salesmanager of the Edison Lamp Works, were also at the conference and are now at Coronado.

M. E. Cooley, president of the American Society of Mechanical Engineers, has appointed the following committee to nominate the national officers of the American Society for the coming year: Professor Alexander Christie, Johns Hopkins University, Baltimore; H. J. Hinchey, Atlanta, Ga.; T. H. Hinchman, Detroit, Mich.; Professor John V. Martenis, University of Minnesota, Minneapolis, and Robert Sibley, editor Journal of Electricity, San Francisco.

John H. Rosseter, who was featured in the Journal of Electricity of last September as Director of Operations of the national Emergency Shipping Corporation, has recently been appointed as representative for the Twelfth Federal Reserve District on the American Acceptance Council. It is also announced that organization of local associations in each district will follow, including one for San Francisco. The movement which the association was organized to foster has been making more headway in the Eastern states than in the West, but a campaign will follow to extend its operations all over the country.

Lieut. Ellery Stone, who is a son-in-law of Theo. F. Dredge, Pacific Coast representative of the Pittsburgh Piping & Equipment Company, and who has for some years been well known in radio work on this coast, is in command of the government radio station at Point Loma and Chollas Heights. These two stations are in nightly communication with the naval radio station at Vladivostok—the longest distance ever covered regularly by radio. The Brooklyn flagship of the Asiatic fleet is reported as copying excellently. Lieut. Stone previous to his receiving a commission in the navy was assistant radio inspector at San Francisco with the Bureau of Navigation, under the Department of Commerce. He is the author of a book on "Radio Communication" now being published which is being used as a text in several of the training schools for government operators.

The following electrical men from the West have recently been elected to associate membership in the A. I. E. E.:

Francis Marion Casal, Jr., Asst. Engineer Tel. & Tel. Div., California Railroad Commission, San Francisco; Wilford W. Clyde, Electrical Engineer, Spring Canyon Coal Co., Storrs, Utah; John Theodore Dontopoulos, Bethlehem Shipbuilding Corp., Oakland, Cal.; Henry Harrison Henline, Instructor in Electrical Engineering, Leland Stanford Jr. University; Charles Roswell Jacobus, Electrical Engineer, General Electric Company, Salt Lake City, Utah; Harry John Lawson, Supt. of Power, Salt River Valley Water Users' Association, Phoenix, Ariz.; Roy Q. MacDonald, Electrical Engineer, Esmeralda Power Co., Tonopah, Nevada; J. Albert Miller, Switchboard Operator, Balboa Substation, Panama Canal, Ancon, Canal Zone; Ernest Lafayette Neil, Draftsman, Shell Company of California, San Francisco; W. T. Newton, Chief Electrician, American Can Company, Mills Building, San Francisco; Lester Siebert, Asst. Manager, Drendell Electrical & Mfg. Co., San Francisco; Jay A. Sly, Chief Engineering Clerk, Northwestern Electric Company, Portland, Ore.; Jack Rodrick Tolmie, Navy Yard, Puget Sound, Wash.; Charles F. Wahl, Wireman, The Panama Canal, Balboa, C. Z.; Frank Oren Wheelock, Toll & Morse Engineer, Pacific Telephone & Telegraph Co., San Francisco; George Kellogg Whitworth, 2nd Lieutenant, C. A. C., U. S. Army, San Francisco.

OBITUARY

Burnett C. Kenyon, formerly president of the Diehl Manufacturing Company and during the past two years purchasing agent for the Crocker-Wheeler Company, died suddenly from pneumonia at his home in East Orange, N. J., on April 5th, at the age of 54 years. Mr. Kenyon had been associated with the electrical manufacturing industry for many years.

Meeting Notices for Electrical Men

(An unusually active two weeks is reported from electrical societies throughout the West. The Pacific Coast Section N. E. L. A. Convention is in session at Coronado and plans for the Westinghouse Agent-Jobbers' meeting, which takes place the week following, are already in shape. The Vancouver gathering of electrical contractors and dealers later in May has issued a cordial invitation for all to attend.—The Editor.)

Utah Engineers

The Utah Society of Engineers is active at the present time in an endeavor to form a new organization or association of engineers which will include, in addition to the present membership of the Utah Society of Engineers, all members of local chapters of national engineering societies; the new organization to be so formed that members of local chapters of national societies would not lose their identity or standing in their present organizations.

The Utah Society of Engineers was organized in May of 1907. The present officers of the society are: President, Leonard Cahoon; First Vice-President, A. C. Watts; Second Vice-President, A. B. Villadsen; Secretary, Wm. H. Kelsey; Treasurer, L. H. Krebs; Member Executive Committee, Fred D. Ulmer. The meetings of the society are now held on the third Wednesday of each month except during May, June, July and August. An annual banquet is held on the third Wednesday of May of each year.

The society publishes a monthly journal containing technical articles and general news of the society.

Seattle Section, A. I. E. E.

The Seattle section of the American Institute of Electrical Engineers held its regular monthly meeting April 15 at the assembly room of the Chamber of Commerce. The first part of the program was given over to the affairs of the section and its relations with the associated engineering societies. The question of giving support to a measure for licensing engineers was brought up but discussion deferred to some future meeting. The address of the evening was delivered by Professor L. F. Curtis, engineering department of the University of Washington, on methods of analysis of alternating-current wave form, as developed by him. The address was illustrated by means of lantern slides, charts and sketches. The next regular meeting is scheduled for May 20.

American Association of Engineers

On Wednesday evening, April 9th, 1919, at the Multnomah County Library Building, about 40 engineers held a meeting for the purpose of sending a formal petition to the American Association of Engineers at Chicago for a Chapter in Portland, Oregon. Fifty-five engineers in the vicinity of Portland have signed up for membership in this organization.

Joint Technical Society, Portland, Oregon

Representatives of the local sections of the A. I. E. E., A. S. C. E., A. S. M. E. and the Oregon Society of Engineers met at dinner at the Hazelwood Restaurant, Thursday evening, April 10, 1919, for the purpose of discussing ways and

means to organize a Joint Society of these associations in Portland, Oregon.

This matter is not formulated in any definite form as yet but progress is being made.

About three weeks ago Mr. C. W. Rice, secretary of the American Society of Mechanical Engineers, was in Portland and started the movement.

Vancouver Convention, Electrical Contractors and Dealers

Definite word has been received that both W. L. Goodwin and Samuel A. Chase will be present at the convention of the Vancouver Association of Electrical Contractors and Dealers on May 26th and 27th, and plans for a rousing meeting

are rapidly going forward. Every electrical man, whether he be manufacturer, central station man, wholesaler, salesman, or contractor-dealer is cordially invited to be present—all meetings will be wide open.

There will be discussions, luncheons, outings, banquets and other diversions. The secretary should be notified you are planning to attend—at 406 Yorkshire Building, Vancouver, B. C.

Research Committee—

A. S. M. E.

Research committees are being formed by the various local sections of the A. S. M. E. with the object of aiding the Research work of the national society, as stated by the national committee:

1. By ascertaining what people within the local district are doing research work. In this division of activity we would like them to obtain a description of the equipment of the individual laboratories, the names of the investigators and owners of the laboratories, the kind of work in which they are interested, and any other equipment data.

2. By ascertaining research in progress and reporting this to the main committee for publication in the Journal if this is not of a private nature.

3. By finding out research problems of manufacturers and engineers in the vicinity who have no facilities for this work, or who desire co-operation from others who may have facilities.

4. By obtaining, if possible, results of research which have not been published, and by obtaining these for publication either as a paper before the Society or as a note for the Research Department.

5. By making suggestions to the Research Committee of fields in which they may be of service, and things which they may do to increase the value of the committee to the Society and to the profession.

The committee as appointed by the San Francisco Section A. S. M. E. consists of: Dr. W. F. Durand, Thomas Morrin, Prof. J. N. Le Conte, Robert Sibley and J. C. Martin.

Los Angeles Transportation Association

The Los Angeles Transportation Association recently invited the Jovian Electric League as guests at a dinner held at Christopher's Cafe on April 15, 1919. Rev. James A. Francis, who has just returned from France, spoke on "The War and After." George E. McCaughan, for 27 years claim attorney for the Rock Island lines, added an interesting half-hour by his "Reminiscences." A surprise entertainment completed the materials of a very pleasant evening.

BUILDERS OF THE WEST—LII.



W. W. CAMPBELL

Down through the ages those who have studied the stars and the infinite cosmos of space have raised world thought and aspiration to higher and more helpful planes of contemplation. To W. W. Campbell, director of the great Lick Observatory upon Mt. Hamilton in California, this issue of the Journal of Electricity is affectionately dedicated, for he has devoted a life effort to a work that has brought out wonderful and useful discoveries, that will throughout all time have a tendency to lift human thought into a certain higher and sweeter sense of the Infinite and His creation.

Jovian Electric League of Los Angeles

By Carl M. Heintz

One of the largest Jovian Electric League luncheons of the year was held Wednesday, April 16th, at the Clark Hotel and proved a big success. For the past month a drive for new members has been in action and the regular Wednesday luncheons have been increasing from around 40 members, about two months ago, until at this meeting there was a gathering of over 100 representatives of the largest electrical houses in Southern California.



Among the prominent electrical men present were Jim Pomroy of Los Angeles; F. C. Millard, Westinghouse Electric & Manufacturing Company, Chicago; J. O. Case, supply department manager, General Electric Company; K. E. Van Kuran, district manager, Westinghouse Electric & Manufacturing Company; C. B. Hall, secretary and treasurer, Illinois Electric Company, Los Angeles; Frank Airey, district manager, Pacific States Electric Company, Los Angeles; F. P. Vose, attorney for the electrical trade of the United States, Chicago; Fred H. Alden, secretary-treasurer, Illinois Wire and Cable Company of Sycamore, Illinois; R. H. Avey, Apex Cleaner Company of Canton, Ohio, and Clark Baker, National Lamp Works, Oakland, California.

The ultimate aim of the League is to bring the attendance at the regular Wednesday luncheons up to between 150 and 200 members, which calls for some real work on the part of the Jovian organization, and a great deal of credit is due to A. E. Peat, president of the League. The splendid meetings that have been held for the past two months have built up a lasting reputation for the Jovian luncheons and gradually the men in the electrical industry in Los Angeles have come around to believe that they cannot afford to miss a Jovian luncheon.

At the conclusion of the 1919 membership drive a club roster roll will be published in booklet form which will contain the name, business affiliation, position, address and telephone number of practically every live electrical man in Southern California.

E. C. Ebert, local manager of the Simplex Electric Heating Company, was chairman of the day and was responsible for this splendid meeting. Hon. Frank G. Tyrrell, a lawyer of national reputation, gave an inspiring talk at this luncheon on the subject, "Are We Growing with California?"

K. E. Van Kuran, district manager of the Westinghouse Electric & Manufacturing Company, one of the broadest-minded business men of California, gave a talk on the subject "The Japanese in California" which should be read by every man and woman in California. His talk follows:

THE JAPANESE QUESTION

By K. E. Van Kuran

Our program announces that Mr. Tyrrell will address us on the subject "Are We Growing with Southern California?" and I would like to add to that, "How Can California Grow to Keep Abreast of the National and International Developments in the World Today?" If California grows with this world spirit, our growth in California will automatically take care of itself. It seems to me that if we are eager for California to grow, we will focus our aims on something bigger than local growth,

knowing that if this is achieved California's growth is as inevitable as the rotation of the earth.

The Japanese question, upon which I have been asked to speak, is a national and international one, and I want to put this question: "In this desire to grow, does California wish to keep out the Japanese? If so, why and on what ground are standing to arrive at this conclusion?"

As business men we pride ourselves on at least aiming to be good business men, and one test of this is good judgment. If we have goods to sell, we give time and thought to finding out about the goods. In selling electric motors, we don't go to the encyclopedia or the Ladies' Home Journal for our information, but we exhaust every source of accuracy and technical data. We study motors. We sell our goods for their real value, and we are sufficiently enlightened to know that false representation is fatal to us and to our goods. In other words, we are intelligent about our goods before we start out to sell them. That is all right in business, but what do we do with bigger issues, national and international issues? Do we follow the same impersonal and thorough plan? I think not. We don't make an exhaustive study of the issues, but we read one line of thought, which we usually get from a newspaper, which is biased; take that which pleases us and say, "This is what I believe." We don't even take the time to analyze it but we decide how the issue will affect us individually and then take our stand.

In regard to this Japanese question—Is it a matter of how much money the Japanese will take from us if they come in and compete? Do we recognize that this economic viewpoint is not basic, for economics change; and there is even a suggestion in the air that economics may not always be such a determining factor as it is now.

Is it a matter of rubbing elbows with a "yellow race"? And is our slogan real equality? Or an equality based on what pleases the individual? Are we reasoning the issue from fundamental principles, or are we feeling the issue, so that as individuals we will not be inconvenienced?

Do we want to decide this or any other question from the way we feel about it, with all the emotions of which we are capable, or do we want to take pride in an intelligent and unbiased judgment? Is economics to be our ideal, or is our ideal to be something bigger and better—that gives every human being a chance to live? This does not mean that everyone would reach the same conclusion, but let us take some pride in throwing off old prejudices and old traditions. Let's get away from this personal, self-centered, imperialistic attitude; shouting about our "rights," when they are only "privileges." We can prove that the Japs should not come in, or we can prove anything we want to, provided we start out with a certain premise, but that is not the kind of logic we want today. We need to analyze so much ore in a chemical laboratory—with our minds—permitting the analysis to bring its conclusions. Then we are in a position to turn into that impersonal conclusion all the feeling of which we are capable.

I would like to know if, from such an analysis, anyone could find one basic reason why the Japs should not come in.

Railway Electrification Study by the San Francisco Section, A. I. E. E.

Professor J. C. Clark, associate professor of electrical engineering at Stanford University, and chairman of the San Francisco Section of the A. I. E. E., has appointed the following committee of engineers to report on the subject of railway electrification agreeable to the resolution unanimously carried at the March meeting of the San Francisco section, that such a committee be brought into existence, the text of which resolution was published in full in the Journal of Electricity, April 15, 1919, and editorial comment made thereon:

J. E. Woodbridge, resident engineer, Ford, Bacon & Davis.
J. P. Jollyman, in charge of electric construction, Pacific Gas & Elec. Co.
L. S. Ready, gas and electrical engineer, California Railroad Commission.
F. H. Fowler, hydroelectric engineer, U. S. Forest Service.
W. J. Davis, Pacific Coast engineer, General Electric Company.
W. P. L'Hommedieu, electrical engineer, Westinghouse Elec. & Mfg. Co.
F. G. Baum, consulting engineer.
A. H. Griswold, plant engineer, Pacific Telephone & Telegraph Co.
Harris J. Ryan, professor electrical engineering, Stanford University.
Clarence L. Cory, professor electrical engineering, University of California.
Robert Sibley, editor Journal of Electricity.
R. Beeuwker, electrical engineer, Chicago, Milwaukee & Puget Sound Ry.

The committee met for preliminary organization at the San Francisco Engineers' Club, Wednesday afternoon, April 23, 1919. Full organization was effected and the following officers elected: J. E. Woodbridge, chairman; F. G. Baum, vice-chairman, and D. I. Cone, secretary (Mr. Cone of the Telephone Company sitting with the committee in the absence of Mr. Griswold, while in France). The next meeting of the committee is set for Wednesday, May 7, 1919, at 1 p.m., San Francisco Engineers' Club.

WESTERN MEETINGS

Oregon Association of Electrical Contractors and Dealers—

April 21—Business meeting of Portland Section at Imperial Hotel.

Jovian Electric League, Los Angeles—

April 9—Harry A. Williams—"Experiences of a War Correspondent"; W. G. Eisenmayer—"Ice and the Electric Business."

April 16—Frank G. Tyrrell—"Are We Growing with Southern California?" K. E. Van Kuran—"The Japanese in California."



In this beautiful spot on the San Diego Coast, the Pacific Coast Section N. E. L. A., Pacific Division, Electrical Supply Jobbers' Association, and California Electrical Contractors and Dealers' Association are now holding their yearly conventions. This is perhaps the most significant gathering of the Western year. Papers of importance from every aspect of the electrical industry in this new era of reconstruction and fresh building are presented and discussed. That the meeting brings with it as well the pleasant value of good-fellowship is to be judged from the program of outdoor sports presented below. The papers of this convention were published in the April 15th issue of the Journal of Electricity and the discussions as they develop at the meetings will be published in the May 15 issue.

San Francisco Electrical Development League —

April 14—F. A. Anderson—"Ship Wiring and Wiring Inspection."

April 21—Rev. Edward Arthur Wicher—"The Victory in Palestine."

No meetings will be held April 28th-May 6th because of the Coronado conventions.

A. S. M. E., Los Angeles Section —

April 16—Frank Honberger—"Manufacture of Gas from Crude Petroleum."

A. S. M. E., San Francisco Section —

April 16—Commander James Reed—"The Torpedo Boat Destroyers in the Making"; Arthur P. Allen—"The American Destroyer and the Part It Played in Winning the World's War."

A. I. E. E., Seattle Section —

April 15—L. F. Curtis—"Analysis of Wave Forms by Means of Indicating Instruments."

May 20—L. T. Merwin—"Novel Features of a High Pressure Distribution System Recently Installed at Portland."

A. I. E. E., Denver Section —

April 9—Lieut. Col. Crocker—"Construction of Army Supply Base at Brooklyn, N. Y."

April 19—Paul M. Lincoln—"The History of Power Transmission."

April 19—Visit to steel works.

Portland Section, A. I. E. E. and N. E. L. A.—

April 7—J. W. Sadler—"Concrete Ships."

League of the Southwest —

April 25-27—Convention.

MEETINGS OF NATIONAL INTEREST

Illuminating Engineering Society —

October—The 1919 Convention of the Illuminating Engineering Society will be held in Chicago, Illinois, as early in October as possible.

Electrical Supply Jobbers' Association —

June 10-12—Eleventh Annual Convention, Hot Springs, Virginia.

National Electric Light Association —

May 19-22—Convention at Atlantic City.

National Association of Electrical Contractors and Dealers—

July 14-15—Executive Committee meeting—Milwaukee, Wisconsin.

July 16-18—Convention, Auditorium, Milwaukee, Wis.

OUTDOOR SPORTS FOR CORONADO CONVENTIONS

TENNIS TOURNAMENT

All those wishing to take part in this tournament must register with Committeeman P. P. Pine before 2:00 o'clock on Thursday. Prizes are on display at the Hotel. Singles will be played any time after Thursday.

KICKERS' HANDICAP TOURNAMENT GOLF FOR MEN

Committeeman G. O. Noble has charge of these events. See him for details.

This will be an eighteen (18) hole handicap. Play in this tournament may take place any time during the Convention. The Professional has set a par for the course somewhere between 63 and 73 inc., and sealed the figure which is in safe keeping and will be opened Saturday afternoon when the prizes are to be distributed. Guess what this par is and notify the caddy master what handicap you need to reach it. Winners will be decided from those whose net score is nearest this par. Prizes are on display at the Hotel.

H. M. BYLLESBY TROPHY TOURNAMENT

This will be an eighteen (18) hole medal handicap play for the H. M. Byllesby Trophy and other prizes.

Play in this tournament will take place on Saturday. Winner of the tournament will have his name engraved on the Trophy and receive a replica of it. Trophy must be won three times for permanent possession. All those wishing to enter this contest must report to Mr. Noble before noon on Friday so that he can properly arrange the handicaps.

(1) DRIVING CONTEST FOR MEN

Best of three balls driven on the practice field. This is near No. 1 tee.

(2) LADIES' GOLF

18 hole handicap for prizes on display at the Hotel. Play in this tournament may take place any time during the Convention, but player must declare intention before playing. All those wishing to enter, report to Mr. Noble for handicap.

(3) DRIVING CONTEST FOR WOMEN

Best of three balls driven on the practice field near No. 1 tee.

SWIMMING TOURNAMENT

For men and women—will take place on Thursday at 5:00 p. m. in the plunge. There will be a 160-ft. sprint for men and an 80-ft. sprint for women, dive for distance for men; also two-man relay race. Those wishing to enter report to Committeeman E. R. Northmore before noon on Friday.

BOWLING TOURNAMENT

The prizes are there and the alleys are fine, so get busy, you pin shooters. There are prizes for two-man teams, total pins for five games, high individual average and high score. There is also a prize for the ladies' high game. Those wishing to take part in the contest, report to Committeeman G. E. Arbogast, who will make arrangements for matches. This must be done before 10:00 A. M. on Friday, and the matches will be played at any time thereafter while the Convention is on.

FISHING

The Tuna Club will give a button for a large tuna, and there is a prize for the largest fish caught during the Convention. Mr. Northmore has the information regarding boats and tackle.

Westinghouse Agent-Jobbers at Del Monte

(With the West looking forward to an era of unusual business activity, the gathering of national representatives and Jobber-Agents of the Westinghouse Electric & Manufacturing Company planned for May 4th to 11th at Del Monte is one of special significance. Not only is the personal contact between men from all parts of the country of great value, but these men of importance in the electrical industry will gain a familiarity with the Western situation and opportunities which they will carry back with them.—The Editor.)

For more than four years, the industrial eyes of this country have been focused on production. The year 1919 finds a re-orientation of economic problems centered around the problem of distribution. The question confronting the manufacturer today is the problem of merchandising the goods—that he is now better able to produce than ever before. The significance of this fact makes such gatherings as that of the Westinghouse Agent-Jobbers' Association at Del Monte on May 4th to 11th of particular timely significance.



John J. Gibson, manager supply department, Westinghouse Electric & Manufacturing Company at East Pittsburgh, who found the West so alluring two years ago when for the first time he was initiated into the mysteries of "Seven-Toed Pete," is again favoring the West with his helpful presence.



Carl E. Heise, San Francisco manager of the Westinghouse Company, responsible in large measure for the Pacific Coast arrangements of the coming Jobber-Agents meeting, will of course be in attendance at Del Monte.



J. M. Curtin, manager of the industrial department of the Westinghouse Electric & Manufacturing Company, will be present to give new ideas along vast industrial uses of electrical energy.



W. W. Briggs, of the Westinghouse Lamp Company, known affectionately in the West as "Wally," comes out from the solitude of New York City to meet again his friends in the West.

This organization is composed of jobbers from all over the United States, who together with guests from other groups and from the electrical industry at large, are to discuss the important questions which the day's problems of merchandising present.

The program is definitely given as follows:

WESTINGHOUSE AGENT-JOBBERS AT DEL MONTE

Monday, May 5, 1919

Morning

Recreations.

11:30 p.m.—Roll Call.

2:10 p.m.—Remarks by Mr. F. N. Averill, President Fobes Supply Company, Portland and Seattle—"Welcome to the Coast."

2:30 p.m.—Remarks by President, J. C. Schmidbauer.

2:40 p.m.—Minutes of previous meeting.

2:50 p.m.—Report of Secretary.

3:00 p.m.—Report of Treasurer.

3:10 p.m.—Report of Membership Committee.

3:20 p.m.—Report of Arbitration Committee.

3:25 p.m.—Report of Accounting Committee.

3:30 p.m.—Report of Auditing Committee.

3:35 p.m.—Report of Executive Committee.

4:00 p.m.—Remarks by Mr. John J. Gibson, Manager, Supply Department, Westinghouse Electric & Manufacturing Company.

5:30 p.m.—Meeting adjourned to 8:15 p.m.

Evening Session

8:15 p.m.—Remarks by Mr. W. L. Goodwin, General Electric Company, Schenectady, N. Y.—"The Goodwin Plan."
Free-for-all discussion of the plan.

Meeting adjourned to Tuesday, May 6th, 9:00 a.m.

Tuesday, May 6th, 1919

Morning Session

9:00 a.m.—Roll Call.

9:10 a.m.—Report of Service Committee, Mr. Charles Robbins, Chairman.

9:40 a.m.—Remarks by Mr. J. M. Curtin, Manager Industrial Department, Westinghouse Electric & Manufacturing Company—"The Industrial Department."

10:00 a.m.—Remarks by Mr. B. Lester, Manager Small Motors Section, Industrial Department, Westinghouse Electric & Manufacturing Company—"Industrial and Household Appliances."



Samuel H. Taylor, president of the Electric Railway Manufacturers & Supply Company, San Francisco, with his proverbial "chinchilla," shown emerging from his chin in the picture herewith, will grace the meeting with his genial presence.



F. N. Averill, president of the Fobes Supply Company with headquarters at Portland, has left his young manager in charge during his leave while he attends the Del Monte gathering of Westinghouse Jobber-Agents.



H. J. Gundlach, manager electrical department, Mine and Smelter Supply Company, Denver, who comes to the Westinghouse gathering as a representative of progressive Colorado.



W. D. McDonald, district manager of the Westinghouse Company at Seattle, will bring down from the Northwest new and helpful ideas.

- 10:45 p.m.—Remarks by Mr. M. C. Morrow, Assistant to Manager, Supply Department, Westinghouse Electric & Manufacturing Company—"The Westinghouse Agent-Jobber."
 11:30 p.m.—Remarks by Mr. F. W. Woolrich, President Commercial Electric Supply Company, Detroit, Mich.—"Westinghouse Agent-Jobber Relations."
 1:00 p.m.—Meeting adjourned to 8:15 p.m.

Afternoon
Recreations.

Evening Session

- 8:15 p.m.—Remarks by H. B. Kirkland, Vice-President American Conduit & Manufacturing Company, New Kensington, Pa.—"Reminiscences."
 8:45 p.m.—Remarks by Mr. W. C. Free, President Free Sewing Machine Company—"The Psychology of the Sale."
 9:30 p.m.—Meeting adjourned to Wednesday, May 7, 9:00 a.m.



C. B. Hawley, all the way from the Intermountain district, Salt Lake City, will first persuade the Jobbers at Coronado that they should meet next at Salt Lake City and then he will attend the Del Monte sessions.



C. B. Hall, secretary-treasurer of the Illinois Electric Company with headquarters at Los Angeles, will represent the great southern district of California.



K. E. Van Kuran, Los Angeles manager of the Westinghouse Company and active in affairs of the California Electrical Co-operative Campaign, will bring new ideas from his district.

Wednesday, May 7th, 1919

Morning Session

- 9:00 a.m.—Roll Call.
 9:10 a.m.—Report of Directors of Advisory Board—Advertising—J. C. McQuiston, C. S. Walker. Supplies—C. D. Williams, J. J. Gibson. Motors—W. S. Blue, W. H. Patterson. Sales Methods—J. C. Schmitzbauer, S. A. Chase.

Demand—T. J. McGill, S. H. Taylor.

Production and Service—F. N. Averill, Chas. Robbins.

- 11:15 a.m.—Report of Advisory Board—Samuel A. Chase, Chairman.
 11:45 a.m.—Report of Mr. N. G. Harvey, Vice-President, Illinois Electric Company, Chairman of Committee to Reorganize Advisory Board.
 12:15 p.m.—Remarks by Mr. T. Julian McGill, District Manager, Westinghouse Electric & Manufacturing Company, Chicago, Ill.—"Training of Men."
 1:00 p.m.—Meeting adjourned to 8:15 p.m.

Afternoon
Recreations.

Evening Session

- 8:15 p.m.—Remarks by Mr. Albert H. Elliot, Secretary and Attorney, Pacific Coast Electrical Supply Jobbers' Association, San Francisco, Cal.—"Get Together."
 8:45 p.m.—Remarks by Mr. N. A. Bowers, Pacific Coast Editor Electrical World and Merchandising, San Francisco, Cal.
 9:15 p.m.—Meeting adjourned to Thursday, May 8th, 9:00 a.m.

Thursday, May 8th, 1919

Morning Session

- 9:00 a.m.—Roll Call.
 9:10 a.m.—Report of Merchandising Committee, T. Julian McGill, Chairman.
 11:15 a.m.—Remarks by Mr. K. E. Van Kuran, District Manager, Westinghouse Electric & Manufacturing Company, Los Angeles, Cal.—"Securing Distributors."
 11:45 a.m.—Remarks by J. C. McQuiston, Manager Department of Publicity, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—"Advertising."
 1:00 p.m.—Meeting adjourned to Friday, May 9th, 9:00 a.m.

Afternoon
Recreations.

Evening
"Ladies Night"—Recreations

Friday, May 9th, 1919

Morning Session

- 9:00 a.m.—Roll Call.
 9:10 a.m.—Remarks by Mr. F. D. Phillips, President, Central Telephone & Electric Company, St. Louis, Mo.—"Observations of a New Member."
 9:45 a.m.—Remarks by Mr. J. S. Tritle, District Manager, Westinghouse Electric & Manufacturing Company, St. Louis, Mo.—"The Original Jobbers' Friend."
 10:15 a.m.—Unfinished business.
 11:00 a.m.—New Business.
 12:30 p.m.—Report of Nominating Committee.
 12:45 p.m.—Election of Officers.
 1:00 p.m.—Meeting adjourned.

Afternoon
Recreations.

Evening

Westinghouse "Smoker," and Distribution of Prizes.



ANOTHER WESTINGHOUSE GATHERING

The present gathering of national representatives of Westinghouse Agent-Jobbers recalls the pleasant banquet of Westinghouse men from the West which was a feature of the Electrical Supply Jobbers' Convention at Del Monte in July of 1917. Those present in this group are: Standing at the left of flag, A. M. Irwin, John J. Gibson. Standing at right of flag, W. E. Dunbar, C. B. Hall. Sitting at table, from left to right: H. H. Hoxie, P. J. Aaron, C. D. LaMoree, Ray Murphy, Carl Will, L. W. Davis, Hugh Bargion, Samuel H. Taylor, Carl E. Heise, C. N. Aspinwall, W. C. Wurfel, Wm. Dick, Carl Wernicke, F. N. Averill, Samuel Adams Chase, C. B. Hawley. At the rear of table, sitting: A. Youngholm, K. E. Van Kuran, R. F. Behan.

HAPPENINGS IN THE INDUSTRY

JOURNAL OF ELECTRICITY ACCEPTED BY A. B. C.

The Journal of Electricity, having received its initial audit by the Audit Bureau of Circulations for the six months ending Dec. 31, 1918, and having complied with all other requirements of the Bureau, is now a member and entitled to full membership privileges.

RAILROAD COMMISSION RATE REGULATION POWER

A decision of far-reaching importance to both retail and wholesale consumers of electricity in California was handed down by United States District Judge W. C. Van Fleet, when he decided, in effect, that the State Railroad Commission has authority to regulate rates, not only between producer and consumer, but also between the producer and intermediate dealers who sell to the consumer.

According to attorneys on both sides, the point involved has never been raised before by any railroad commission in the country, and the case will be carried to the United States Supreme Court for final adjudication.

The suit is one by the Napa Valley Electric Company to prevent the Railroad Commission from regulating the rates it shall charge to the California Light and Telephone Company of Calistoga. More than a year ago the Commission reduced this rate from 4 cents to 2 cents per kilowatt hour. The Napa Valley company appealed to the State Supreme Court for a writ of review, contending that the Railroad Commission was without authority to regulate such rates, because the California Light and Telephone Company is not a consumer, but a dealer in electric energy.

The Supreme Court denied the writ and held that the Railroad Commission acted within its authority. And now the Federal Court holds that the State Supreme Court had full jurisdiction to act in the case.

A UNIVERSITY PRESIDENT

The following resolution as adopted by the California Section of the American Chemical Society regarding the presidency of the University of California, accepts the standard set by the Journal of Electricity for this office. This matter is of such wide interest and permanent importance that it is eliciting expression from engineering organizations throughout the state.

Resolution

Whereas, the California Section of American Chemical Society, the membership of which comprises all chemists of the northern part of the state of California, are vitally interested in the future development of the University of California, and the policies that are to be followed there:

On this account the California Section of the American Chemical Society is deeply concerned in the type of man the Board of Regents of the University of California will appoint to the presidency of this university.

Whereas, the California Section of American Chemical Society, although not prepared to make a specific recommendation as to an individual for the presidency of the University of California, are desirous of suggesting to the Board of Regents the only type of man that should be considered by them. This can not be done better than in the words of the Journal of Electricity of San Francisco, of March 15th, 1919:

"Theodore Roosevelt in his address in the Greek Theatre at Berkeley in 1911 said that the great universities, while paying heed as they ought to turning out men and women who will be of practical service in the life of the state, should also remember that our national life will be hopelessly one-sided unless we also steadfastly turn our attention to developing the kind of men and women who shall be masters in exceptional kinds of work; unless in addition to vocational training we have a cultural training which shall fit men to do the highest and best work in the fields of literary and artistic endeavor, and in the field of pure science—of

abstract science, of science not pursued with any expectation of making it immediately remunerative.

"But to meet the needs of the hour the new university must be prepared to give even more. The great crying need of the hour is for vision—vision to see beyond the jealousies, the hatred, the avarice, and the entanglements due to petty considerations of race, religion, or localized community of interest—vision that will offer more of hope and courage to humanity as a whole. On the Pacific Coast where the same waters wash the shores of the new civilizations that wash the shores of the oldest civilizations of the world, perhaps this need is even more emphatic.

"Hence the man to undertake such a task as that of the presidency of the University of California must be one familiar with the ideals of the Eastern civilization, yet whose very heart-throbs pulsate with the life-giving energies of our great West and what it has in its native values to offer of helpfulness to humanity. He must be a man of courage—a man of conviction—a man of vision—such characteristics may indeed be said to make up the scholar in the highest sense of the word.

"And no other type of man will be satisfactory to the people at large, for such a man is needed to direct the affairs of this, one of the world's greatest and most influential institutions of learning, and thus make possible the fullest contributions the West may have to offer in giving of its best toward shaping the destinies of the world."

Be It Therefore Resolved, That the above expresses the unanimous sentiments of the California Section of the American Chemical Society.

And Be It Further Resolved, That a copy of these resolutions duly executed be forwarded to each member of the Board of Regents of the University of California.

EXHIBIT OF PHYSICAL APPARATUS

In connection with the annual meeting of the American Physical Society in Washington, D. C., April 25 and 26, it is planned to have an exhibit of physical apparatus at the National Bureau of Standards, illustrating the application of physical principles to the solution of war problems. In view of the fact that the National Academy of Sciences will be in session in Washington on April 28th to 30th, inclusive, on which latter date there will be a joint meeting of the National Academy and the National Research Council, it is planned to hold the exhibit open through April 30th for the benefit of the visiting members of the above organizations.

VICTORY LOAN DATA

Carter Glass, Secretary of the Treasury, has announced the dates upon which payments will be required on the notes of the Victory Liberty Loan, as follows:

- 10% with application on or before May 10.
- 10% on or before July 15.
- 20% on or before August 12.
- 20% on or before September 7.
- 20% on or before October 7.
- 20% on or before November 11, with accrued interest on deferred installments.

Payment in full can be made on May 20, the 10% required with application having been duly paid on or before May 10. Payment can also be completed on any installment date with accrued interest.

LATIN AMERICAN TRADE

Latin America is the subject of a popular series of six lectures being given in San Francisco by George Welton Fishback under the auspices of the University Extension Division, with the cooperation of the Foreign Trade Club of San Francisco. The topic for the first talk, on April 23, was "Latin America—What It is Like." Succeeding lectures will be: April 30, "Our Diplomatic and Consular Service at Work"; May 7, "Extending Our Trade with the Southern Republics"; May 14, "South America from Panama to the Argentine"; May 21, "Central America and the West Indies"; May 28, "A Gold Mine for United States Enterprise."

In his introductory talk Mr. Fishback said:

"During the fiscal year ending June 30th of last year we sold to Latin America \$740,000,000 worth of goods, and bought a little over \$1,000,000,000 worth. This shows that we supplied about 40% of the imports of Latin America, as

compared with 15% before the war. The point is, are we going to keep this gain now that our competitors are back in the field? We have all the facilities—banks, ships, distributing houses, all the tools. Are we going to know how to use them?"

EVERY DISABLED SOLDIER OR SAILOR SHOULD KNOW

That the Government is resolved to do its best to restore him to health, strength, and self-supporting activity.

That until his discharge from hospital care the medical and surgical treatment necessary to restore him to health and strength is under the jurisdiction of the military and naval authorities.

That the vocational training which may be afterwards necessary to restore his self-supporting activity is under the jurisdiction of the Federal Board for Vocational Education.

That if he needs an artificial limb or other orthopedic or mechanical appliance the Bureau of War Risk Insurance supplies it free upon his discharge and renews it when considered necessary.

That if, after his discharge, he again needs medical treatment on account of his disability the Bureau of War Risk Insurance supplies it free.

That any man whose disability entitles him to compensation under the War Risk Insurance Act may be provided by the Federal Board with a course of vocational training for a new occupation, and he will also be paid as long as the training lasts a monthly compensation equal to the sum to which he is entitled under the War Risk Insurance Act or a sum equal to the pay of his last month of active service, whichever is the greater.

That on the satisfactory completion of his training the Federal Board, through its employment service, will assist him to secure a position.

That public authorities and other large employers will in many cases, at least, give the disabled soldiers and sailors preference when filling vacant positions, provided they possess the training necessary to fill them.

TRADE NOTES

Personal Items —

F. A. Gearhart of the Crouse-Hinds Company, San Francisco, has been in the Northwest territory for a week.

A. K. Kahn, purchasing agent of the Pacific States Electric Company, has returned to San Francisco after two weeks spent in the Northwest.

W. I. Otis, representing the Square D Company of San Francisco, makers of Square D Switches, is visiting Seattle and other Northwest cities.

Fred Alden of the Illinois Wire Company, Sycamore, Illinois, was in Seattle for several days recently and will go to San Francisco and Los Angeles.

L. E. Sperry, representing W. N. Mathew & Company, headquarters in San Francisco, has returned to San Francisco after a trip through the Northwest.

Change of Name —

The Braemer Air Conditioning Corporation announces a change of name to the Atmospheric Conditioning Corporation. The new organization will continue to handle Webster Air Washers, Humidifiers and Dehumidifiers, Webster System of Automatic Humidity Control, Generator Coolers, and equipment for maintaining artificial atmospheric conditions in industrial plants.

Extension Course —

Elementary electricity, with special attention to fundamental principles upon which all electrical trades depend, will form the basis of study of a new University of California Extension course which is to be held at 8:20 o'clock Tuesday evenings in the Polytechnic High School. This is in addition

to the correspondence course now being given by the Universities of California and Oregon in conjunction with the Journal of Electricity.

New Business —

M. C. Baker & Son of San Francisco have a large force of men installing ventilating and heating systems for the government at Angel Island and the Bolinas Wireless Station, as well as at the Moorehead Laboratories in San Francisco.

List Prices —

The Davis Slate & Manufacturing Company, Chicago, are distributing "Fair-List" No. 7 which gives the list prices and shipping weights for the complete range of sizes of electrical slate and marble. It is a well printed booklet of 24 pages and contains much information of interest and value to electrical engineers and switchboard builders.

Civil Service Examination —

The United States Civil Service Commission announces open competitive examinations for junior electrical engineer, for men only, May 7, June 4 and July 9, 1919. Vacancies in the Bureau of Mines, Department of the Interior, for duty at Pittsburgh, Pa., or elsewhere, at \$1,080 to \$1,200 a year, and in positions requiring similar qualifications at these or higher or lower salaries, will be filled from these examinations.

Electric Furnace Meeting —

Important steps were taken to promote the use of various electric furnace products, at a meeting called by Mr. Acheson Smith, vice-president and general manager of the Acheson Graphite Company, held at Niagara Falls on Friday and Saturday, March 21 and 22. The meeting passed resolutions inviting all manufacturers of electric furnaces, electrical apparatus, electric furnace supplies and accessories, public utility corporations, designers and inventors of electric furnace equipment, and the users of electric furnaces to become members and to join in making an aggressive and thorough campaign to disseminate to engineers and to the public accurate data as to the quality of electric furnace products of all kinds. The organization formed is to be called the Electric Furnace Association. A permanent organization was created as follows:

President—Mr. Acheson Smith, Acheson Graphite Co.
First Vice-President—Mr. C. H. Booth, Booth-Hall Company.
Second Vice-President—Mr. W. E. Moore, Pittsburgh Electric Furnace Co.
Secretary—Mr. C. G. Schluenderberg, Westinghouse Electric & Manufacturing Company.
Treasurer—Mr. F. J. Ryan, American Metallurgical Corp.

Important committees were created to begin work without further delay. These are as follows:

Publicity—C. H. Booth, chairman; C. A. Winder, C. G. Schluenderberg, A. B. Oatman.
Data—W. E. Moore, chairman; J. A. Seede, A. M. Williamson, F. J. Ryan, F. A. Fitzgerald, and C. A. Vom Baur.
Fields—F. T. Snyder, chairman; F. J. Tone, H. A. De Fries, and S. L. Walworth.

The president was authorized to get in touch with all companies and persons who should be interested in joining the organization, and was requested to arrange an early meeting when completed publicity plans could be presented and thoroughly discussed. In the meantime the different committees were instructed to make every effort to rapidly perfect reports which could serve as a basis for constructive work.

Lighting Installation —

J. J. Agutter & Company, electrical engineers and contractors, 622 Fourth avenue, Seattle, have just finished the lighting and power installations in the plant of the Air Reduction Sales Company, 3623 East Marginal Way, also the power and lighting installations at the new Chauncey Wright restaurant at the corner of First avenue and Columbus street.

Washing Machine Campaign —

The most successful washing machine campaign in the history of the Utah Power & Light Company was conducted during the month of March. During the month a total of

977 washing machines of various types were sold. The "peak" day of the campaign occurred on March 31 when 168 machines were sold. Good window displays aided materially in creating interest.

Change of Owner —

R. W. Nicol, president of the Capital Electric Company, Salt Lake City, on March 29 disposed of his interest in that concern to the General Electric Company of New York. Mr. Nicol has been in the electric supply business in Salt Lake City for the past thirty years and is very well known throughout the inter-mountain territory. He started one of the first two electric jobbing houses in that vicinity.

H. D. Randall, local manager of the General Electric Company, assumes the duties as president of the Capital Electric Company. No effort at consolidation with the General Electric Company is contemplated under the change of management, although a very considerable extension of business of the local concern is contemplated. The company already operates a dozen branches in Utah, Idaho, Montana and Wyoming. Mr. Nicol expects to retire.

Electric Lines Combined —

With a capital of \$6,000,000, the Utah-Idaho Central Railroad and the Cache Valley Railroad, the electric systems of the northern part of Utah, have consolidated, the incorporation papers having been filed with the secretary of state on April 8th.

The Utah-Idaho Central Railroad Company is capitalized at \$5,000,000, divided into shares of \$100 each. The Cache Valley Railroad Company, called the Valley Company, is capitalized at \$1,000,000, divided into 10,000 shares of \$100 each.

The document filed declares that the roads are not parallel or competing, but connecting lines, and that it is considered that for the best interests of the property they should be consolidated. Therefore, the two companies have been incorporated as the Utah-Idaho Central Railroad Company of Ogden, with a capital of \$6,000,000. Half of the shares are preferred and half common.

Fifty thousand shares of the Utah-Idaho Central will be converted into common stock, one share of common stock for each share of capital stock. Six thousand shares of Valley Company stock will be converted into preferred capital stock of the Utah-Idaho company, three and one-third shares of preferred capital stock of the Utah-Idaho Central company for each share of Valley company.

The company will have nine directors, though this number may be decreased to seven. The first directors are M. S. Browning, L. R. Eccles, Joseph Scowcroft, W. H. Wattis, D. C. Eccles, L. B. Porter and G. L. Becker, all of Ogden, and M. S. Eccles of Logan. M. S. Browning is president, L. R. Eccles and Joseph Scowcroft, vice-presidents, Royal Eccles, secretary-treasurer, and W. A. Whitney, general manager.

Price Reductions —

Announcement of revised price lists which involve material reductions is made by the Edison Electric Appliance Company, Inc., and by the Edison Storage Battery Company, effective April 1st and March 1st, respectively.

Electrified Ranch —

W. C. Thole, lessee of the Le Franchi ranch, near Sebastopol, California, has just completed having his place electrically equipped. A. O. Hanson, local electric contractor, has done the work of installing an electrical milking plant, refrigerating plant, and a five-horsepower motor, as well as installing electric lights in the house and milkhouse. In order to furnish the ranch with its electrical power the Pacific Gas & Electric Company had to run a half-mile extension from the town of Sebastopol.

New Business —

Allis-Chalmers Manufacturing Company, Seattle, has closed a contract for a 10-inch suction 8-inch discharge, two stage centrifugal pumping unit for the Olympia, Washington, municipal water works. Pump and motor are both of Allis-Chalmers make. The motor is 100 horsepower 60 cycle, 3-phase 440 volts, and will deliver 1150 gallons a minute against a head of 235 feet. The unit will be supplied with a flexible coupling mounted on an extension to the pump shaft opposite the motor so that a steam turbine can be direct-connected at some future time. A switchboard controlling the equipment is also furnished. It is expected that the unit will be in operation in July.

Thompson & Castleton, electrical engineers and contractors, 316 First avenue South, Seattle, have received the contract for rebuilding the entire electrical machinery at the plant of the Puget Sound Bridge & Dredging Company at Port Angeles, consisting of a 650 horsepower motor and starting apparatus. The machinery destroyed by fire was at the Elwah dam of the Northwest Power & Manufacturing Company where it was being used in sluicing operations with a view to sealing the dam.

Home Wiring Campaign —

A convenient and useful folder containing sales helps and suggestions is sent out by the Society for Electrical Development. The folder fits into any letter size file and its contents are listed as—

- (1) "The When, Where, Why and How of Electrifying Your Home"—which contains all approved plans for soliciting and securing house wiring contracts.
- (2) "Sales Helps"—which contains all the newspaper, mail and other advertising material for conducting a successful house wiring drive.
- (3) Letters and envelope to Women Prospects, in colors.
- (4) Letter to Men Prospects, in colors.
- (5) Envelope enclosure, "Uncle Sam Says: Electrify Your Home."
- (6) Printed return postcard for use with the above letters.
- (7) Order blank for ordering from the Society cooperative sales and advertising helps, mats, cuts, slides, letters, etc.

Company Reorganization —

A. W. Leonard, president of the Puget Sound Traction Light & Power Company, has announced a partial reorganization of the company, just prior to his departure from Seattle for a two weeks' trip to Philadelphia, Boston and New York. A complete reorganization will take place about May 1, when President Leonard expects to return to Seattle. The changes made just before his departure were found to be necessary in order to readjust the company management after the sale of the street car lines to the city. The position of manager of auxiliary operations is created and the position of assistant to the president is abolished. W. J. Grambs, who has held the position of assistant to the president under both President Leonard and his predecessor, becomes manager of auxiliary operations and under the new plan will report to the vice-president, W. H. McGrath. The position of chief electrical engineer is created and G. E. Quinan, who has been electrical engineer for the Seattle division, is given the new position. Upon the promotion of Quinan, S. C. Lindsay, who has been assistant engineer on the Seattle division, is made engineer. Following the resignation of G. A. Richardson who was called east by Stone and Webster to assist in the reorganization of the eastern traction lines, H. R. Leigh, Jr., is appointed superintendent of the "Washington Auto Bus Company." Until the reorganization of the Seattle division of the Puget Sound Traction Light & Power Company is made, all heads of departments will report directly to Vice-President McGrath.



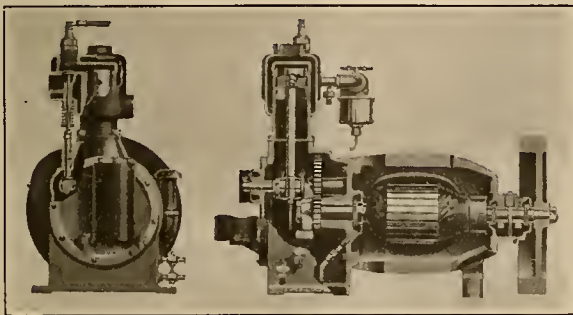
LATEST IN EVERYTHING ELECTRICAL

(An automatic lighting plant of small size, a roll and food warmer with a combination self-closing door and bread tray, enameled resistance units of various types and a new and compact master controller which is smaller than previous designs and intended for use with automatic magnetically operated controllers are here reported.—The Editor.)

AUTOMATIC LIGHTING PLANT

The Matthews Engineering Company of Sandusky, Ohio, have added to their line of Full Automatic Lighting Plants which heretofore has consisted of 1, 2, 5 and 15 kilowatt plants, a new size known as their "Little Husky." It carries a 300 watt continuous rating on the generator.

This plant is made in the 32 volt type, similar to their 1 kw. plant, their argument being that even for so small a plant as this the limitations of a lower voltage make it most undesirable for the practical applications that a 15 light



Small size automatic lighting plant

plant will obtain. This plant is the simplest possible kind of a direct connection of a generator to an engine.

The generator frame and engine crank case are cast integral. The engine is a 4 cycle water cooled type 2 in. bore, 3 in. stroke. The plant is guaranteed to have 35% overload capacity. A 60 ampere hour Willard glass cell storage battery is used with the plant.

Main bearings are 1 3/16 in. diameter, 2 in. long. The connecting rod is 1 in. diameter and 1 3/4 in. long. The ignition is from a 32 volt spark coil, and the breaker is mounted on the end of the cam shaft. The coil is mounted on the end plate of the crank case. The armature is the standard laminated drum type, hand wound with closed slots for retaining the windings. It is impregnated with Bakelite varnish and baked.

This is the first announcement that has been made of any lighting plant of this size and type.

FOOD WARMER

A new electric roll or food warmer has been put on the market by the Duparquet, Huot & Moneuse Company.

This fixture while designed to keep rolls warm and fresh, should find extensive use as a food warmer owing to the small amount of current consumed and the arrangement for supplying moist heat. The moist heat is automatically supplied by a sight feed device with a water tank connected to the house water supply or filled by hand as required, which shows the amount of water supplied at all times—this water being evaporated by the electric heating element.

The current consumption is 600 watts which can be obtained from a lighting circuit and is controlled by a switch mounted on the warmer with an indicating pilot light.

The roll warmer is heated by two 300 watt General Electric Company's sheather wire units placed one on each side of the compartment, arranged to allow free circulation of the heated air.

The novel feature of this warmer is the self-closing door sliding up while the lower portion drops down and forms a shelf which can be used to set a bread tray on while filling. The door opening device consists of an arrangement of levers actuated by a foot bar extending across the front of the warmer which is placed flush with the front, thereby avoiding any projecting part. An adjustable air cushion is provided to prevent doors from closing too rapidly. Pulleys, chains and counterweight are eliminated.

This warmer is ordinarily constructed of galvanized iron, double walled, insulated with air cell asbestos. Special warmers however can be made of American Russia iron with polished steel or nickel plated trimmings or polished monel metal throughout. Four tinned wire shelves are provided, each 25 inches square, to place the rolls on.

ENAMELED RESISTANCE UNITS FOR CURRENT REGULATION

Enameled resistance units for regulating current have been developed in various forms and sizes by the General Electric Company of Schenectady, N. Y. Some of the applications to which these units have been put are railway and fire alarm signals, fractional horsepower motors, and locomotive headlights. They are also used extensively in series with relay, contactor and circuit breaker coils on panels and



Headlight dimming resistor with cover removed

switchboards. They will be found particularly applicable in mines and similar places where a great amount of dampness and moisture are present. These units are unique in their ability to withstand unusually high temperatures as well as sudden changes in temperature from one extreme to the other.

The resistance wire or conductor is wound either upon a steel body coated with a special refractory enamel or paint and high heat resisting silicate compound developed to withstand sudden extreme temperature changes without cracking or weakening or in any way being injured. The steel body is preferred for extreme lengths where strength for a long span is required and is especially serviceable where the unit might be subjected to severe vibration or shock.

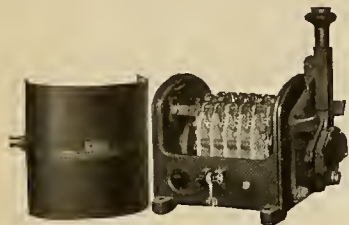
The refractory silicate body is used for most of the ordinary types of resistance. The compound employed is far superior to porcelain or any equivalent ceramic products which are easily cracked or weakened mechanically by repeated and extreme temperature fluctuations.

After being wound upon the proper body the conductor is embedded in a blue vitreous enamel and is fused, until it has a uniform glossy structure, at a temperature of about 1000 deg. C. This enamel is moisture and heat resisting and forms a mechanically strong casing for the conductor. Enamels of the type used are extremely durable and maintain their dielectric strength and mechanical properties indefinitely.

Several different methods of attachment to the circuit have been developed as shown in the accompanying illustration. A variety of units of various sizes and ohmic capacities have been standardized and units of a special nature are obtainable.

NEW MASTER CONTROLLER

A new multi-speed full reverse master controller that may be mounted horizontally or vertically, thus permitting in the former case a straight line movement of the handle and in the latter case a radial movement, is shown in the accompanying illustration. This master is smaller than previous



New compact master controller

designs and is intended for use with automatic magnetically operated controllers. It will be found especially useful in connection with steel mill and crane controllers where the operator's attention should not be diverted from the work or machine and where space is limited.

An internal gear drive which is entirely enclosed but which is readily accessible by the removal of four screws in the lower portion of the operating handle, eliminates the liability of accident to operators through the catching of fingers or clothing in the bevel gears usually employed in straight line drive control. A centering latch operated by a button in the handle indicates to the touch the "off" position of the master, while a strong notching spring is used to indicate the five positions in either direction. A maximum of twelve fingers may be mounted on the finger-board, using six in one direction of rotation and six in the other. The new controller, although very small and compact, is so designed that by the removal of two bolts the entire finger-board may be taken from the frame, while the removal of three bolts allows the entire shaft and contact fingers to be withdrawn. Inspection, renewals, and repairs are therefore easily effected. The construction of the finger-board and drum follows the C-H standard, in that the fingers and segments are clamped to square insulated steel shafts, and adjacent contact points are separated from each other by arc barriers. This master controller is a new development of the engineering department of the Cutler-Hammer Company of Milwaukee.

Books and Bulletins

Electric Appliances

The Robbins & Myers Company of Springfield, Ohio, have issued an attractive series of bulletins featuring their line of fans. One comprehensive folder recently gotten out lists the lantern slides, window displays, electrotypes, letter folders and other dealer helps which the company is prepared to furnish.

"Do You Believe in Signs?" is the title of an effective circular showing actual installations of different types of Federal Electric signs in San Francisco which has been issued by the Federal Sign System (Electric) for western trade.

Western Electric products are featured in a large two-color folder recently sent out to dealers. A special enclosure calls attention to advertising which has been published in national magazines relative particularly to Habirshaw Insulated Wire.

A 1919 catalog of electrotypes for newspaper advertising has been issued by the general office of the General Electric Company.

A list price of electric appliances, a striking folder in colors addressed to dealers under the heading "Make a Quick Turnover" and several dealer's helps in the form of small folders on irons and grills have been sent out by the Hotpoint Division of the Edison Electric Appliance Company.

A bulletin on Electric Furnaces for Industrial Purposes and an announcement of a generous advertising policy have recently been sent to the trade by the Edison Electric Appliance Company.

An attractive bulletin consisting of a personal letter and a catalogue of G-E apparatus and appliances carried in stock is part of the recent publicity undertaken by the Mohawk Electrical Supply Company of Syracuse, N. Y.

Among the recent bulletins of the Benjamin Electric Manufacturing Company is a two-color folder on the Two-Way Plug, a catalog of electrotypes for use in advertising these plugs and a price list applying to Marine Lighting and Signaling Apparatus which is supplementary to the larger catalog already supplied.

The Reynolds Electric Company has issued an attractive bulletin in black and red featuring their flasher for electric sign use and the Reco color hood for quickly changing the lamp colors.

The Eureka Vacuum Cleaner, manufactured by the Eureka Vacuum Cleaner Company, is advertised in an attractive booklet in Chinese style which tells the story of the use of this cleaner in the forbidden city of Peking, designed for use by the dealer in interesting customers.

Bureau of Standards Bulletins

Bulletin No. 73 of the Bureau of Standards by C. E. Waters deals with data on the oxidation of automobile cylinder oils.

H. W. Bearce and E. L. Peffer are authors of Technologic Paper No. 77 of the Bureau of Standards, entitled "Density and Thermal Expansion of American Petroleum Oils."

"A Portable Cubic-foot Standard for Gas" is the subject of Technologic Paper No. 114 of the Bureau of Standards by M. A. Stillman.

Annual Reports

The Annual Report of W. G. McAdoo as Director General of Railroads is released in a series of pamphlets under the title of Labor, Public Service and Accounting, Traffic, Law, Capital Expenditures, and Suggestions and Complaints.

The director of the Bureau of Mines has made his report to the Secretary of the Interior for the year ending June 30, 1918, containing a record of the past year's work which is of special interest from its war achievements.

The annual report of the directors of the American Telephone & Telegraph Company to the stockholders for the year ending Dec. 31, 1918, gives the financial status of the associated companies and discusses the question of what should be done in the way of laws governing telephone systems.

The Public Utilities Commission of Idaho has issued its report for the year ending June 30, 1918, covering the activities of the commission during that period.

The biennial report of the state engineer of Oregon gives much data of interest on irrigation district matters and the adjudication of streams.

The annual report of the director of the Department of Terrestrial Magnetism tells of the cruise of the "Carnegie" and of other important work carried out by the department during 1918.

Safety Bulletins

A publication of the Industrial Accident Commission of California, Bulletin No. 8, relates to the "Safety Requirements for the Storage and Use of Explosives in Mines, Quarries and Tunnels."

NEW ELECTRICAL DEVELOPMENTS

(An electric smelting project in British Columbia and various adjustments in the city railway situation in Seattle are reported from the Northwest. In the Pacific Central District, irrigation interests are active and beginnings are being made on several of the large power projects for which plans have been announced. A million-dollar motion picture plant is planned in Los Angeles. In Idaho the problem of electric heating has again come up at Burley, as the capacity of the government plant is not sufficient to meet the growth of the town.—The Editor.)

THE PACIFIC NORTHWEST

PORTLAND, ORE.—The Scott Electric Company has increased its capital stock to \$25,000.

MALHEUR, ORE.—A further \$600,000 issue of bonds to complete the Warm Springs Irrigation District has been endorsed at a recent meeting of land owners.

SEATTLE, WASH.—An ordinance has been passed authorizing the Board of Public Works to purchase a 100 kilowatt motor generator set for the light department.

FERNDAL, WASH.—The Whatcom County Light & Power Company recently began setting poles inside the city limits of Ferndale and will probably have electric service in operation here around May 1st.

SEATTLE, WASH.—An ordinance has been referred to the Board of Public Works calling for an appropriation of \$60,000 for double tracking the municipal street railway on a portion of East Lake avenue.

SEATTLE, WASH.—A contract amounting to about \$100,000 was awarded the Pacific Lamp and Supply Company by the Board of Public Works, to furnish the city with incandescent light bulbs for the ensuing year.

SEATTLE, WASH.—The city of Seattle has acquired through Kinnear, Paul & Company, a site for an additional substation for the city light and power plant. The consideration was \$15,000 and erection of the substation will begin soon.

ANACORTES, WASH.—The board of county commissioners has granted a one-year permit to the Kaiser Paving Company to construct a power line in connection with paving the Avon-Allen road, for which it has a contract from Skagit county.

CHEHALIS, WASH.—A special election was to be held on April 10th on the question of granting a franchise to the Washington-Idaho Water, Light & Power Company to construct and operate lines for transmitting electric power in this city.

SEATTLE, WASH.—A bill has been passed by the city council and signed by the acting mayor, appropriating \$10,000 from the city railway fund and authorizing changes on the fifth floor of the county-city building to accommodate the enlarged car line and law departments.

MARSHFIELD, ORE.—The Mountain States Power Company, Marshfield division, has closed a contract with the Johnson Lumber Company at Coquille, Ore., for 150 horsepower in motors. This is in addition to the present power installation of the company which expects to install additional motors in the near future.

SEATTLE, WASH.—Seattle's traffic laws covering all phases of movement of pedestrians, automobiles, trucks, street cars and other vehicles on the public streets, are to be revised, amended and made to conform to existing conditions, according to a decision reached recently by the public safety committee of the city council.

EDMONDS, B. C.—Officials at the plant of the Pacific Smelting Company's works at Edmonds, B. C., state that through electric smelting they are able to manufacture calcium carbide giving five per cent higher gas yield than that manufactured under the older method. It is stated that plans

are being drawn for a large and permanent plant for this company.

CENTRALIA, WASH.—The Mendota Coal Company, with offices at Centralia and plant at Mendota, Wash., is now purchasing electrical equipment for the electrification of its mine. Requirements call for a 100 kw. engine-driven generator, 440 volts three-phase, and approximately 100 h.p. in motors for operating hoist, fans and pumping machinery.

TALENT, ORE.—Completion of the legal details for the certification of the bonds of the Talent irrigation district, Jackson county, signalizes the completion of an enterprise that will bring intensive development of a thickly settled, well-developed section that needs only an abundant water supply. Water for this district is to be diverted from the Applegate river, Wagner creek and McDonald creek.

SEATTLE, WASH.—Obligation on the part of the city government of Seattle, to conduct the street railway at a profit and turn into the general fund an amount of the profit sufficient to offset the loss of approximately \$400,000 of taxes and franchise revenues which would be paid by the system under private ownership, is set forth in a report of the bureau of taxation of the Chamber of Commerce and Commercial Club.

KLAMATH FALLS, ORE.—The owners of property bordering on Upper Lake, north of here, fearing that the erection of the dam proposed by the California-Oregon Power Company at the lower end of the lake will raise the lake level higher than at present and ruin their land, are circulating a petition to be sent to the Secretary of the Interior to investigate the matter further before permitting the power company to proceed with their project.

TACOMA, WASH.—As a result of negotiations between the city council of Tacoma and George W. Tilden, of Seattle, for the purchase by the city of the Lake Cushman power site, members of the council decided that they could not present the proposition to the people of the city for ratification in its present form. As the proposition offered by Tilden contained only about half of the land necessary it was deemed advisable to end negotiations for the time being.

FLORENCE, ORE.—This city may buy the electric light plant owned and being operated here by G. G. Bushman of Eugene. Bushman has made a proposition to sell. The plant includes a steam generating station, street lights and distributing system to private consumers, both in Florence and at Glenada across the river. A committee has been appointed by the city to investigate the feasibility of making the purchase and to ascertain what the plant can be obtained for.

THE PACIFIC CENTRAL DISTRICT

STOCKTON, CAL.—One-man street cars are now in use in this city.

TRACY, CAL.—The new bond issue of \$60,000 provides \$10,000 for electroliners.

VISALIA, CAL.—A petition for the organization of an irrigation district was presented to the supervisors at their meeting on April 4th.

MADERA, CAL.—Another big tract in Madera county is being put on the market and when this is done there will

be formed an independent irrigation district for the purpose of supplying the tract with water.

TERRA BELLA, CAL.—The directors of the Terra Bella Irrigation District have sold \$40,000 in bonds with which to finance construction of extensions to the district.

TULARE, CAL.—At the meeting of the directors of the Tulare Irrigation District a resolution was passed by unanimous vote calling for necessary improvements and extensions to be built at a cost of \$10,000.

NEVADA CITY.—Big Tunnel, the long bore that carries water of the Snow Mountain ditch of the Pacific Gas and Electric Company through a mountain fifteen miles north of this city is undergoing extensive repairs.

MARYSVILLE, CAL.—The breaking of a pipe line at the Colgate Power House of the Pacific Gas and Electric Company caused damage at the power house and the substations at Nicolaus and in this city. Electric power was shut off for about two hours.

DOWNIEVILLE, CAL.—Contracts already let insure the building during the coming summer of the power and debris dam at Bullards Bar, over the Yuba river, the purpose of which is to permit the operation on a large scale of the famous Brandy City mines.

OAKLAND, CAL.—The Alameda council has granted the San Francisco-Oakland Terminal Railways permission to install track connections at Ninth street and Santa Clara avenues, Alameda, permitting the switching of trailers in handling traffic to the beaches.

SANTA MONICA BEACH, CAL.—The merger between the Pacific Telephone and Telegraph Company and the Santa Monica Bay Home Telephone Company has become a fact. The Home Company takes over all the property and business of the other concern on April 1.

MODESTO, CAL.—The irrigation district directors have called a special election for May 2 to vote upon \$205,000 in bonds with which to buy sixty-six second feet of water for six months of the year from the Sierra & San Francisco Power Company, and for extensions and betterments in the district.

ORLAND, CAL.—The Northern California Power Company has a crew of men at work on what was formerly the Kaiser ranch, southeast of Orland. There are now fifteen wells, either ready to furnish water or in immediate prospect. They are being connected up with the power lines for pumping purposes.

SAN BERNARDINO, CAL.—A project for a great irrigation enterprise in the northwestern corner of San Bernardino county and southeastern corner of Kern county is under way. Wasted waters from Owens river, in Inyo, are to be used. The dam proposed to be built will cost from \$10,000,000 to \$12,000,000.

OROVILLE, CAL.—L. J. Abrams and C. N. Hill, who have charge of the organization of the proposed Honcut Irrigation District, have filed on 1000 second feet of water in the Feather river on behalf of the proposed district. The filing states that the water will be pumped into a flume at about two miles below Oroville.

FRESNO, CAL.—Construction of a \$300,000 reservoir and dam on the Chowchilla river to irrigate 10,000 acres of land situated in Madera and Merced counties, and the subdivision of this land into 20- and 30-acre vineyards, will be done by Umben, Kerner and Eisert of San Francisco, according to O. L. Markley, their local representative.

PALO ALTO, CAL.—For some time the municipal gas and electric plant here has been supplying current for electricity consumers in North Palo Alto, across the county line. An offer has been made by the Cooperative Land Company to donate the lines to the city, and the board of public works recommends the acceptance. It will result in a slight revenue above operating expenses.

STOCKTON, CAL.—The San Joaquin Light and Power Company has rented the Otto house just above the station for their general headquarters during the construction of the road which is to be built down to the river, where a new power house is soon to be erected. At present there are twelve men, surveyors and their helpers, living in the house.

WILLOWS, CAL.—Applications for rice irrigating water received by the West Side Canal Company up to the last day for making applications totaled nearly 54,000 acres, according to figures compiled by John P. Ryan. This is twice the amount irrigated under the canal system last year and twice as much as can be served this season, since the capacity of the canal will be but little, if any, more than in 1918.

ADIN, CAL.—At the meeting of the supervisors of Lassen county, a petition signed by fifty-five land owners and asking the formation of the Big Valley Irrigation District, was presented. The proposed district would place 23,000 acres under irrigation. The water would be taken from Ash Creek, which flows through Adin and empties into the Pit river. The site for a dam will be in Round Valley, a small valley at the head of Big Valley.

TUDOR, CAL.—Power lines to supply the big irrigation pumps in the vicinity of Tudor will be extended. Plans have been completed to extend the lines from the Bigger place below Oswald to Tudor, past the H. A. Walton place and then east to Tudor. Three large property owners who are planning the extensions are: J. B. Snook, of the Abbott Orchard, John Saunders, of Tudor, and H. A. Walton. Work is expected to commence in two weeks.

SAN FRANCISCO, CAL.—Frank G. Drum, president of the Pacific Gas and Electric Company, has announced that the common stock has been restored to its former dividend basis, 5 per cent per annum, payable in quarterly installments. A regular quarterly dividend of 1¼ per cent was announced, payable on the common stock on April 21, on stock of record April 8. The figures submitted at the annual meeting reflected the largest business, although not the largest net revenue, in the history of the company.

REDDING, CAL.—Construction work on the Pacific Gas and Electric Company's great power development in the Big Bend of the Pit river will be resumed as soon as land titles are straightened out with the government. This is according to E. B. Hanley, manager of the company's land department, who has been here looking up records. Work on this great undertaking was cut short during the war, and great stores of supplies that had been laid up for winter were sold off. The project calls for the expenditure of \$17,500,000.

SAN FRANCISCO, CAL.—An agreement reached by the Pacific Gas & Electric Company and the Pacific-Portland Cement Company, Santa Cruz Cement Company and Standard Cement Company recently provided for the abrogation of contracts made in 1911 binding the cement companies to buy electric energy from the gas company exclusively for a ten-year period and paves the way for new contracts, if these are desired later. For the present, the cement companies do not seek new contracts. They are willing to be charged under a block cement schedule which lowers the rate as the power use increases.

SAN JOAQUIN VALLEY, CAL.—Preliminary surveys have been completed for the large hydroelectric project in charge of Horace M. Wooley, an electrical and hydraulic engineer of Los Angeles. According to Wooley, the total cost of the project will be in the neighborhood of \$6,000,000 and it is planned to develop 100,000 kilowatts on the Kings river. The first development will consist of a power plant to be located near the mouth of the north fork of the Kings river, which will have an initial capacity of 20,000 kilowatts. Later a system of reservoirs is to be built at points up stream and generating plants installed. The project is being financed by a group of Eastern capitalists and the formality of incor-

porating will not be gone through with until actual construction work is under way. Power generated by the proposed plants, Wooley said, would be used first for agricultural purposes and later for transportation in the event of the electrification of the San Joaquin division of the Southern Pacific.

THE PACIFIC SOUTHWEST

BRAWLEY, CAL.—A municipal electric plant is being considered by the city trustees, as stated by President A. P. Higgins.

LOS ANGELES, CAL.—A petition has been filed with the Board of Supervisors of Los Angeles county for establishing a highway lighting district to be known as Cudahy Lighting District of Los Angeles.

PHOENIX, ARIZ.—Manager Eyler of the Pacific Gas & Electric Company proposes that the council of Mesa should build a pipe line from Phoenix to Mesa, the Mesa plant being inadequate to take care of the winter demand.

SAN BERNARDINO, CAL.—The Southern California Edison Company has made application for a franchise for a period of 30 years to construct, etc., poles, conduits, cables and wires along public highways within the limits of La Verne.

AVALON ISLAND, CAL.—A bond election will probably be decided upon for the erection of an electric or gas plant. It is estimated that a gas plant using oil would cost about \$42,000. Hamilton Beach has been suggested as a good location.

SANTA BARBARA, CAL.—Hope Ranch Park and Ontario are to be subdivided into residence districts and a water system for domestic purposes and irrigation is to be installed. Tunnels and wells and an immense reservoir will be built—steel pipe to be laid.

HOLLYWOOD, CAL.—Geo. W. Gerry and L. W. Smeltzer have purchased the electrical shop of O. L. Doolittle on Hollywood Boulevard. The business, conducted under the name of "Hollywood Electrical Shop," is to carry a large line of electrical machines and apparatus.

LOS ANGELES, CAL.—A 21-year franchise was sold to the Pacific Electric Railway Company for \$100 by the city council for the Echo Park Avenue line, and a portion of the Pacific Electric lines on Sunset Boulevard from Echo Park Avenue to Hill Street tunnel, where previous franchise rights were in doubt.

LOS ANGELES, CAL.—The Bonnie-Reed Film Manufacturing Company of Niles contemplates the construction of a motion picture plant, including studios, offices, laboratories, warehouse, grand stands, power plant, etc., on Sunset Boulevard and Bronson Avenue, to cost about \$1,000,000. Train & Williams, Exchange Building, are the architects.

COALINGA, CAL.—The city trustees decided to purchase the Coalinga Gas & Power Company plant and distributing system in the city, and passed a resolution of their intention, to the end that the gas company officials can make immediate application to the State Railroad Commission for the sale, and hold a stockholders' meeting to ratify the action of the board of directors. The sale price is \$40,000, plus whatever oil and bricks are on hand at the time of the city's taking the plant over.

THE INTER-MOUNTAIN DISTRICT

SALT LAKE CITY, UTAH.—Jas. A. Stump, a lawyer of Salt Lake City, in the interest of clients whose names are not divulged, has applied to the state engineer to divert 125 second feet of water from the Sevier river for the operation of a power and lighting plant to serve the counties of Sevier, Piute and Beaver.

BRIGHAM CITY, UTAH.—The Public Utilities Commission of Utah has issued an order granting the petition

of Brigham City to increase its lighting rates from 5c to 7c per kw-hr. and to rebuild the present street lighting system. Paving improvements will also be made at the time the street lighting system is rebuilt.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has applied to the Utah State Engineer for permission to appropriate 125 second feet of water from Logan river for developing 3250 horsepower. The company will construct a large weir type timber dam and intake, the diverting channel to consist of 10,032 feet of iron pipe.

WINNEMUCCA, NEV.—Preliminary surveys of the great irrigation project in the Humboldt River Valley backed by local and San Francisco capital, has been begun. A channel is to be constructed across the old lake bed in the Battle Mountain basin, to be followed by a reservoir and water distributing system. A bond issue of \$5,000,000 will be required to finance the project.

SALT LAKE CITY, UTAH.—A special committee of the Salt Lake City Commercial Club was appointed to investigate the question of installing a white way lighting system to extend the entire distance along the newly paved highway between Salt Lake City and Ogden. It was found, however, that the cost of installation and upkeep of such a lighting system would be prohibitive at the present time.

PUEBLO, COLO.—The Arkansas Valley Railway Light and Power Company will serve the Pope Block with 100 h.p. of electrical energy covering their entire lighting and power requirements. The private plant which was formerly operated in this building will be abandoned. The company has completed an installation of twenty 250-watt Mazda street lamps in Minnequa Heights, one of Pueblo's suburbs.

MILLVILLE, UTAH.—The citizens of Millville recently held a mass meeting to determine whether or not the town should bond for the purpose of installing a pole line so that the town may enjoy electric service. The vote was overwhelmingly in favor of the project and the town board was authorized to make the necessary preparations for issuing the bonds. Millville is in the Logan valley in Cache county.

MACKAY, IDAHO.—The application of the Mackay Light & Power Company for a certificate of convenience and necessity enabling the company to furnish electric service for the entire Lost River Valley has been granted by the Public Utilities Commission of Idaho. The company expects to spend approximately \$50,000 in this extension and will furnish service to the towns of Arco, Moore, Leslie and others in the Lost River Valley.

BURLEY, IDAHO.—The town of Burley is experiencing some difficulty with its electric service due to insufficient capacity to meet the general growth of the town. The town in the past has secured current from the government project at an exceptionally low rate, with the result that considerable electric heating load has been built up. It will either be necessary to discontinue the furnishing of current for heating purposes or more than double the present rates for service. The cost of rebuilding the distribution system would amount to from \$15,000 to \$20,000.

CEDAR CITY, UTAH.—A deal between the Dixie Power Company and the Cedar Electric Company for the purchase of the Cedar plant and the connecting of the Cedar City load with the former's plant on the Santa Clara river, has been consummated and the new management took charge April 1st. The present plant at Cedar City will be utilized until the line can be reconstructed with heavy copper wire from the Santa Clara plant to Cedar City. Reconstruction materials have already been ordered for the Cedar City distributing system and for the extension of the high power line to Cedar City and through the Cedar valley, where in addition to taking over the present load, current will be furnished to the settlements of Enoch, Hamilton's Fort and Kanarra, as well as for various pumping plants throughout the valley.

THE VACUUM CLEANER

THE VACUUM CLEANER

JOTTING DOWN IDEAS on scraps of paper and storing them in sacks was the method of one famous author for collecting the material for his books. That, or something like it, is the purpose of this page. To be sure, the ideas do not belong to the Editor—but they are a record of the little happenings of the week—sparkles from other people's minds—which deserve jotting down. Then from drawers and baskets and shelves the Vacuum Cleaner is permitted to gather them at random and here present them for record.—The Editor.



A Timely Plea—is this little quotation which deserves repetition:—

Not with a bleared and smitten brow,
Not with a broken sword
Nor smouldering in defeat we bow
Who come before Thee, Lord;
But kneel where flags of freedom throng,
Hope of the nation's eyes;
Lord God who made'st our soldiers strong
Make Thou our statesmen wise.

MELVILLE CHATER.

This should be accompanied by slow music—surely you recognize the tune. R. J. Davis of the Century Electric Company sends it in as an example of poetic justice:

"Darling, here's your warrior bold!
Silver stripes instead of gold
Shine upon his sleeves today
'Cause he couldn't sail away."
"But, my darling, don't you bleat—
No one thinks you had cold feet!
You had to do as you were told—
Silver stripes instead of gold."

Nature faking has apparently not yet entirely gone out of style. Here is a quotation from a British Columbia newspaper which notes a most remarkable phenomenon:

One of the new Canadian hydroelectric plants at Niagara Falls will utilize the power from water falling 305 feet of the 300 feet difference between the levels of Lake Ontario and Lake Erie.

Serious poems as well as limericks are occasionally achieved by men of electrical affiliations. Here is a little free verse from the pen of Lieut. Emmet N. Britton which appeared in a recent issue of the Pacific Service Magazine. Lieut. Britton is a son of John A. Britton and was formerly connected with the Pacific Gas & Electric Company on the Spalding development. He has recently returned to San Francisco with his regiment.

"SOMEWHERE IN FRANCE"

The bright autumn sunshine, cold in the shade,
A quaint street in an old French town
Winding down a hill, losing itself in a sharp turn at the bottom.

An old Frenchwoman cleaning a pair of wooden shoes at an open window.

A detachment of American troops going back to the front;
Their feet iron-shod make the cobbles ring.

A cat on a red tile roof stirs sleepily.

The footsteps die away.

The old lady closes the wooden shutter.

The cat stretches itself into sleep again.

All is quiet except the quacking of the ever-present duck eating the swirl out of the gutter.

Dry Toast is predicted as the fashion after July 1st. In the meantime Frank A. Leach, Jr., district manager of the Pacific Gas & Electric Company at San Francisco, was toasted at the Rotary Club, thus:

"Leach—Frank in name and nature—a dispenser of matter in its rarified state, used for lighting, cooking and empty talk. Also controller of an invisible power 'Watt' rotates the wheels of industry."

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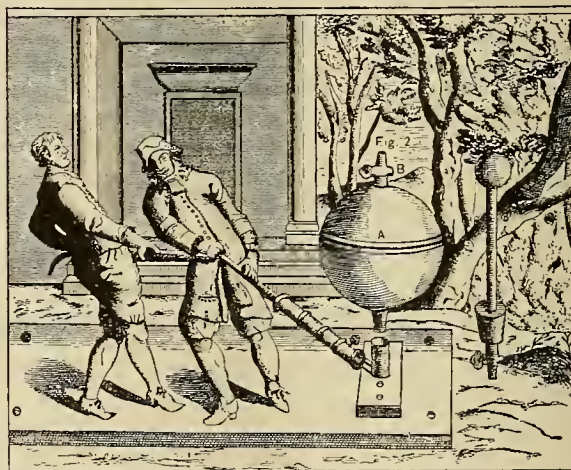
Address W. BREWSTER HALL, Pass & Seymour.

"Call up the department store, Mabel, and order a power plant." Here is an item sent in from a rural newspaper for the news columns of the Journal of Electricity:

STOCKTON, CAL.—T. Manikowske, president of the Wind Electrical Company, with headquarters at Wyndmere, N. D., is stopping at Hotel Bronx with his wife and daughter and inspected various locations in Stockton with a view, he said, toward establishing a factory for the manufacture of his power plants in this city.

Is this an evasive answer on the part of Manikowske or an editorial hallucination?

ENGINEERS OF YESTERDAY—8. Von Guericke
(A Series Compiled by A. L. Jordan)



Did you ever hear of the "horror vacui"?

For two thousand years people thought that there could be no such thing as a vacuum; that Nature had a horror of empty space. Galileo knew that a vacuum had something to do with the refusal of a suction pump to work if the well was over 33 ft. deep; Torricelli produced a vacuum in his barometer; von Guericke was the first to build "air pumps" (1650). He found that a clock in a vacuum cannot be heard to strike, that a flame dies out in it, that animals perish, etc. He constructed hollow ("Madgeburg") hemispheres 1.2 ft. in diameter which, when exhausted, required sixteen horses to pull them apart. In early life he was an engineer in the army of Gustavus Adolphus, becoming burgomaster of Madgeburg in 1646.

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JOURNAL OF ELECTRICITY

VOL. 42. NO. 10

SAN FRANCISCO, MAY 15, 1919

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LIPMAN BROS.' BAKERY, SALT LAKE CITY. D. W. Lipman was a partner in the United Grocery and when the demonstration was made there he was convinced of the feasibility of Electric Cooking. When the Lipman Bros. Co. was organized he asked for Electric ovens to do their baking. Their business enlarged and they have since added one No. 200 to their original equipment.

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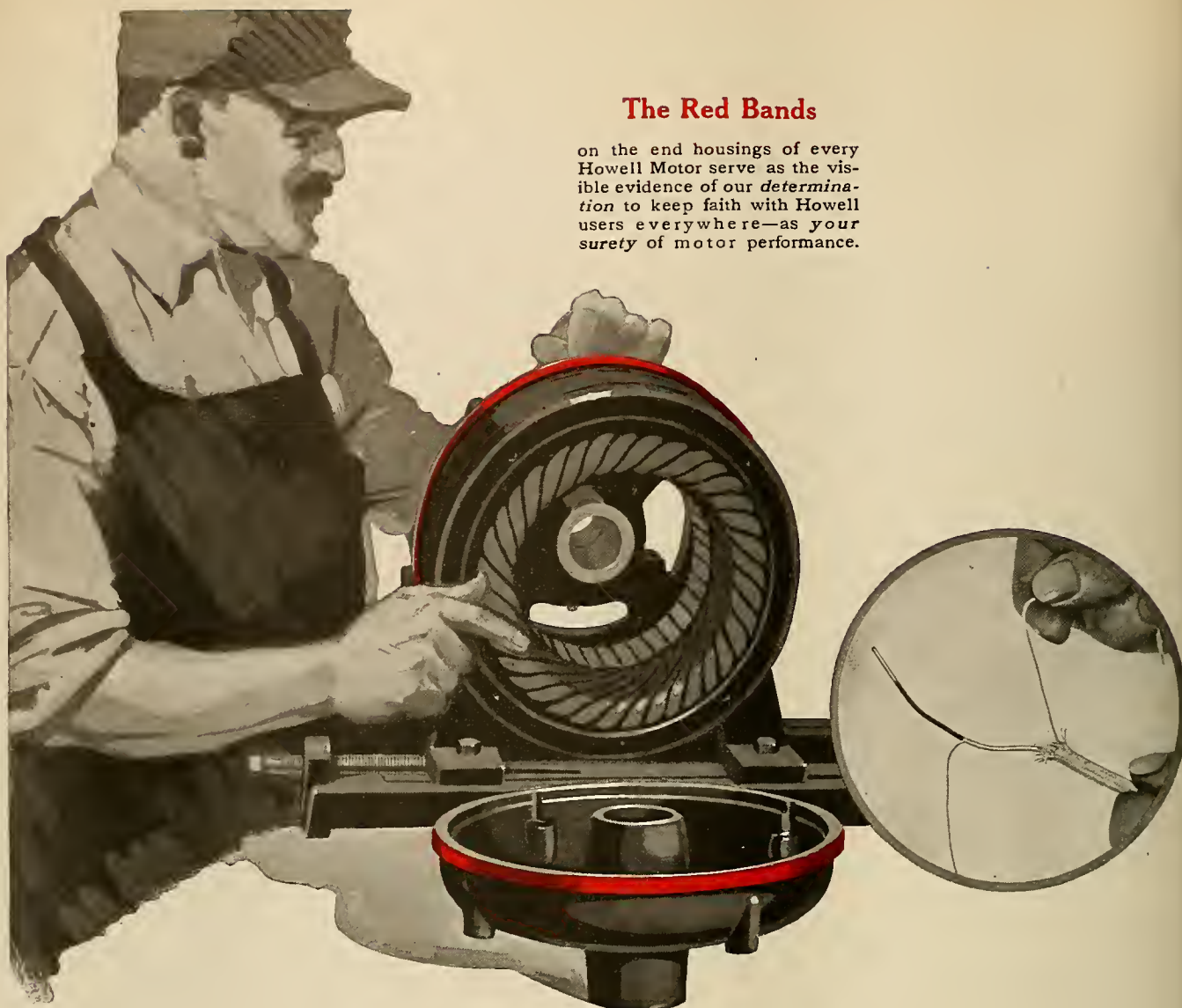
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FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, MAY 15, 1919

NUMBER 10

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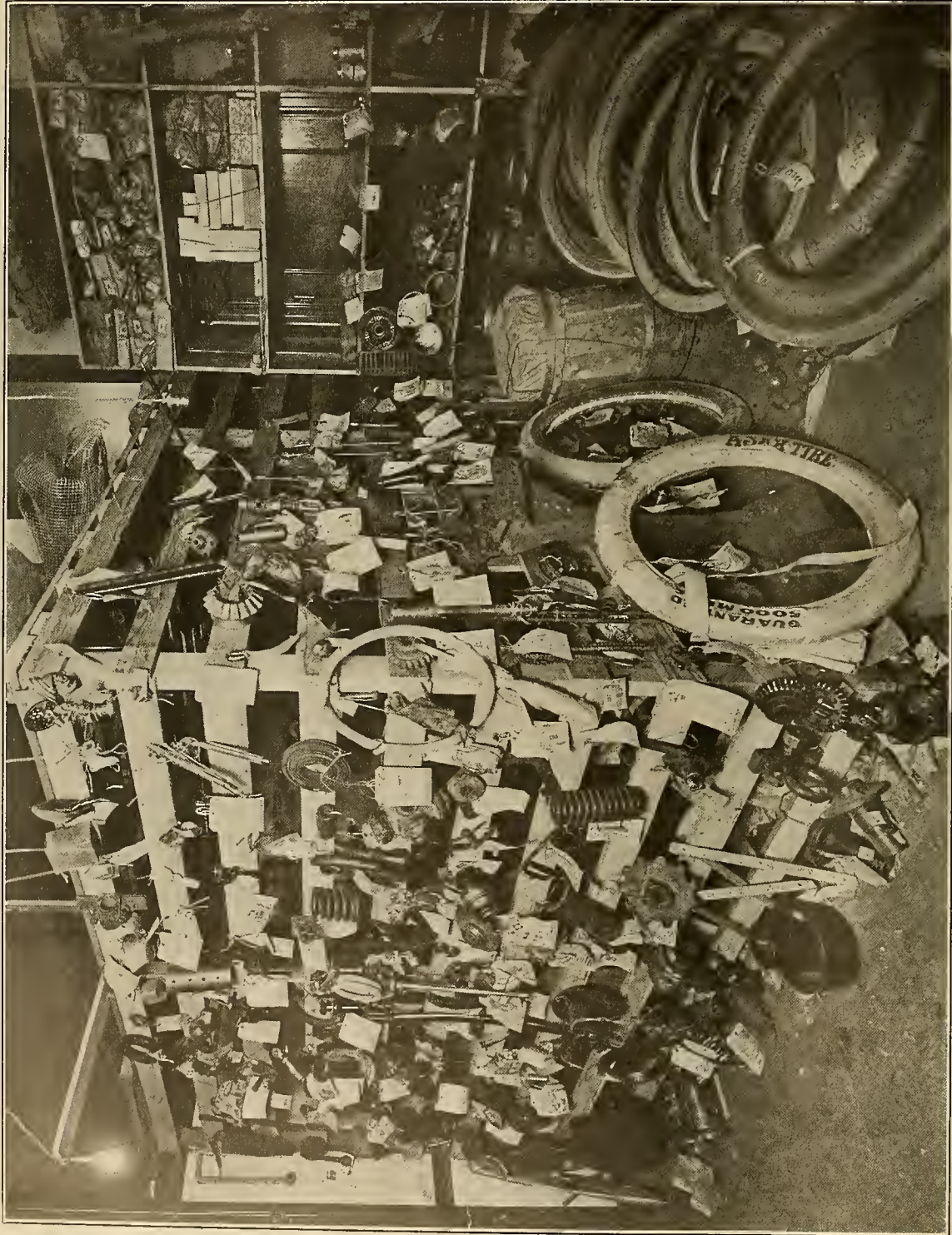
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FROM the shipping department of the electrical retailer, the wholesaler and the manufacturer flow daily a stream of packages whose fate is entrusted to the express company — with what inadequate safeguards is to be judged from this picture. This is merely one corner of one department of a No Mark Bureau, made necessary by the thousands of packages sent monthly without any address whatsoever, or with the mark illegible. The express company's damage claims, in spite of every precaution, mount into millions of dollars yearly, largely on account of improper wrapping and of such cases as these.

*"Mark Right
Pack Right"*



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42

SAN FRANCISCO, MAY 15, 1919

Number 10

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THE CORONADO CONVENTIONS

The outstanding feature of the recent Coronado conventions, comprising as they did representatives from all branches of the electrical industry in the states of New Mexico, Arizona, and California and an investment of nearly three-quarters of a billion dollars, was the remarkable directness with which deep and perplexing problems facing the industry were attacked and terse conclusions drawn.

First and foremost among these conclusions must be mentioned the hearty endorsement expressed on all sides looking toward the development of self-determination in so far as problems are of common interest and contact can be maintained with all parties to the issue. Thus, expression was heard among engineers on all sides endorsing the strong emphasis of section development and the utilization of the national body as the clearing house of discussion between sections. Again, the appointment of local representatives on national committees it was urged should be made only after consultation with local committees covering the same phase of engineering investigation. This idea was also strongly expressed in the resolution declaring against the promulgation of a national Code of Ethics by the Bureau of Standards, as it is felt that personal contact with actual problems met in the industry demands leadership on the part of state regulatory bodies rather than the national body at Washington. Then, too, due to the fact that the California Electrical Cooperative Campaign has worked out such wonderful results in coordinating the industry, a general expression of sentiment favored this size of unit as the best for contact in our present development, and while all agree that a national campaign or organization is desirable, the feeling is emphatically expressed that such an organization should serve rather as a clearing house and not as a governing body.

In the matter of automatic control of small power plants, great steps forward were heralded at the Coronado conventions and unquestionably the development of many of the countless small water power projects existent throughout the West has been given an impetus that will be felt in the economic life of our nation. But the feature that stood out foremost along engineering discussion in the Engineering Committee report, the Public Policy Committee report and the Committee on Resolutions, was the evident conviction that railway electrification is upon us. Full cooperation has been pledged to the San Francisco Section of the American Institute in its earnest investigation of this problem by a number of the foremost electrical engineers of the West, as previously announced in these columns.

The growth of the code of ethics promulgated by the California Electrical Cooperative Campaign, based on the fundamental principle that "he profits most who serves best," was another outstanding feature of the convention. The Resolutions Committee report fairly rings with endorsement of this principle and it is even urged that foreign commercial and engineering policies, now matters of such vast importance in Pacific Coast ports, be shaped

along similar lines and thus assist in assuring the peace of the world.

But above all other considerations the inspiration gathered by following the words uttered by the president of the California Railroad Commission at the banquet was perhaps the most interesting and helpful thing that transpired. Here was an audience of five hundred gathered together in banquet for a frolicking farewell after arduous labors of a week of convention discussion. Yet when put to the challenge by the president of the Railroad Commission as to whether the present vast economic scheme of utility development in the West would meet the demands of service, the attitude of the audience, clearly showed by the thoughtful attention given the speaker, that men of the electrical industry in the West consider the choice between private ownership and public ownership not the challenge,—but that the real point at issue is the sensing of a need for service. To him who senses that need for service and supplies that service at a just and reasonable cost will eventually be granted the privilege of serving his fellow man to the highest degree attainable.

The president of the Railroad Commission was pleased to compliment his audience upon the fact

that the electrical industry in the West had attracted to it the brightest and keenest brains produced in the nation. To the close observer of modern trend of thought, this must be admitted to be a fact. It is well for us to seriously ponder this conviction and what it means. It means that men of the West today engaged in this industry will unquestionably have a part in formulating many of the policies during the next decade that will go toward shaping the destinies of the world in this gigantic period of readjustment—and in the words of the president of the Railroad Commission, while we are not ready to say out-and-out that complete success will be theirs, yet our conviction is such that we are ready to place a bet.

It is a strange situation when business men go about optimistically patting each other on the back and saying by way of words of cheer, "Well, I don't believe prices are going down." Yet that is just what is happening in the United States today. And it is not the prices at which they sell their product to which they refer, either, but rather the cost of the raw materials and labor they are going to have to pay to produce it. Literature is at hand in large quantities from such agencies as the Division of Public Works of the United States Department of Labor—and even from private manufacturers and commercial organizations, all coming to this same conclusion.

The object in view, of course, is the encouragement of the prompt resumption of business on a normal scale. In the meantime, irrespective of prices and their future tendencies, business seems to be going ahead at a steady gait. "It is still one of the wonders of the time," says a recent bulletin from the Chamber of Commerce of the United States, "that the present volume of business continues so large." This is in spite of the fact that building and construction, which are usually the barometers of general business, have not yet resumed anything like normal volume. However, the outlook even in this field is reported as better and the expectation is for an increase during the next four months of from fifteen to twenty per cent in the volume of building compared with the same period last year. Along some few lines, such as copper, which were inflated to meet a demand entirely abnormal, prices have dropped precipitously and mines are operating at only half capacity, but in general price reductions are moderate and seem to act as a stimulant to buying rather than as a deterrent.

The district west of the Rocky Mountains is inclined to be skeptical on the subject of home wiring campaigns. In the knowledge that power consumption per capita in this great region is four times as great as that elsewhere in the United States, that homes and farms are in most districts fully ninety per cent wired, it is figured that a campaign to reach the other ten per cent would hardly pay.

Prices and the Business Situation

Home Wiring in the West

This is, however, a short-sighted view. To be sure Pasadena, California, is reported as having every house in the city wired and connected—with a population of 42,000 there are said to be 15,600 meters—but few cities are in this condition. It is interesting to note that the contractor-dealers of the adjacent city of Los Angeles recently discovered to their surprise that that city has probably some six or eight thousand homes which are without electricity. How many of the homes which are wired are fitted out with up-to-date conveniences of outlets and remote control switches which provide the inhabitants with an incentive to make full use of their electricity? The realization of the value of convenience outlets has been a more or less recent development—and the fact that most of the houses of a city were wired early in the history of this electrical era, may be just the reason for their needing additions and improvements to the wiring at the present time.

Census statistics show that approximately 9,000,000 homes in the United States are lighted by electricity—nearly twice that number are using gas or coal oil. Statistics fail to show, moreover, how well lighted those electrically wired homes are. One manufacturer estimates that they contain more than 10,000,000 empty lamp sockets. How many electrical appliances are idle and how many unsold to customers whose houses are not conveniently wired for their use? You may saturate your market numerically—the wants of man are never satisfied. And the basis of the ability to meet these ever-growing wants is modern house wiring.

The Americanization of the foreigners who come to our shores is one of our first duties. The foreign school which encourages the failure to learn English and the foreign organization which speaks and thinks in terms of the civilization from which it has come, should be done away with—by law if necessary. But this worthy campaign for the bettering of our foreign citizenship should not be construed as an argument for the prevention of the study of foreign languages by our own young people. There has been too great a tendency in our schools—and even in recent sessions of state legislatures—to discourage the study of foreign languages altogether.

Americans, perhaps as a consequence of their isolated position, have always been far behind Europeans as linguists—and in consequence have suffered greatly, not only in the absence of widespread ability to keep up with technical advance, but in the practical intercourse of foreign trade. How important is the knowledge of Spanish can only be judged by those who deal with Mexican and South American firms. Tales of what is really said by the interpreter to customers in China are part of the stock of good stories possessed by almost every business man familiar with the Orient. Time and again the criticism is made of American business in the foreign field, that its agents are at a disadvantage with those of England—or Germany, or Japan—because

dependent on interpreters in their intercourse with the field.

The new world order about to be established lends a new significance to this question. It has truly been said that if the world could speak one language, ninety per cent of the dangers of war would be removed. We could advertise our various brands of democracy and ideals to the peoples of the world rather than to the few in charge and give them a chance to choose between the advertised goods on the basis of a value which they understand. The next best thing to a universal language, of course, is the wide understanding of many languages.

The need for an engineering representative in the cabinet who shall have supervision of all public works under national direction has long been felt. There are at present engineering works being carried on under five different departments, not to mention separately constituted commissions for the direction of individual undertakings, such as the Panama Canal. That such work should be coordinated, so that it may be planned as a whole and carried out as parts of one great enterprise, is a proposition which hardly needs defense. It is only the inertia of the present situation, the difficulties of readjustment and in some measure the unwillingness of those now handling the undertakings to relinquish their authority which stand in the way of its immediate accomplishment.

The conference of engineering societies held on April 23-25 in Chicago for the purpose of discussing the establishment of a Department of Public Works has taken the first step toward the desired end. The details of this meeting are reported elsewhere in this issue. It was composed of delegates from engineering societies throughout the United States—one from each organization represented—and may be considered as representative of the opinion of the engineering profession.

The major action of the conference was the unanimous adoption of a resolution favoring the establishment of a Department of Public Works and the recommendation as to the work which should come under the supervision of that department. The recommendation provides for the establishment of this department by the grouping of government bureaus, services and other activities whose functions are predominantly of an engineering or architectural character under what is now the Department of the Interior and thereafter designating that department "The Department of Public Works." This forestalls any objection on the part of legislators to the crea-

tion of an additional cabinet position. The personnel, compensation and general plan of organization of these bureaus is to remain the same, readjustments in the interest of simplification and coordination, or later expansion, to be met as the needs arise.

Appreciating that one of the major difficulties confronting the transfer will be the removal of river and harbor work from military supervision, it is suggested that the relation of the army engineers to such work be not changed and that there should be no relinquishment of non-military duty by the Army engineers now on such duty until their transfer to military duty can be made without detriment to public interests.

The bureaus and activities which are selected as logically belonging in a Department of Public Works are—

- A Bureau of Public Roads.
- The U. S. Reclamation Service.
- The Alaskan Engineering Commission.
- The Construction Division of the U. S. Army.
- A Bureau of River, Harbor and Canal Work, including such functions as are now exercised by the Mississippi River Commission and the California Debris Commission.
- A Bureau of Architecture.
- A Bureau of Surveys, including the Coast and Geodetic Survey.
- A Bureau of Mines.
- A Geological Survey.
- The Forest Service—at least until the same is divorced from the supervision of water powers and road building.
- The Bureau of Standards.

It was considered unwise at this time to determine to what extent the proposed Department should control the activities of the General Land Office, the National Park Service, the Bureau of Lighthouses, the Bureau of Indian Affairs, and of the Public Health Service and various commissions and these were left for consideration at a later date, preferably until the department had been organized.

The action taken by this representative congress for the first time puts the proposition of such a national engineering department in the realm of possible realization within the near future. It is to be expected, of course, that there will be some opposition on the part of departments now supervising the expenditure of the moneys involved, but the mere excuse that present conditions grew up naturally owing to a failure to foresee the importance of engineering as a national factor should not be permitted to stand in the way of betterment. Nothing more vital to efficiency and constructive accomplishment along national engineering lines has ever been attempted—this proposition deserves the united support of engineers, individually and through their organizations.

NEW JOURNAL SERVICE: Plans for issues ahead include a feature article on Electrical Installations on Shipboard by F. A. Anderson, electrical inspector with the U. S. Shipping Board, to appear in the June 1st issue; a description of the interesting technical features of Montana's new copper mill—an electric heating number, and a vacation number. Watch for articles of particular value to your particular needs.

Especial attention is called to the fact that it is still possible to enter for the course on practical electricity offered by the Extension Division of the Universities of California and Oregon in cooperation with the Journal of Electricity. Four articles of the series used as a text have already appeared but back numbers can be furnished those entering late.

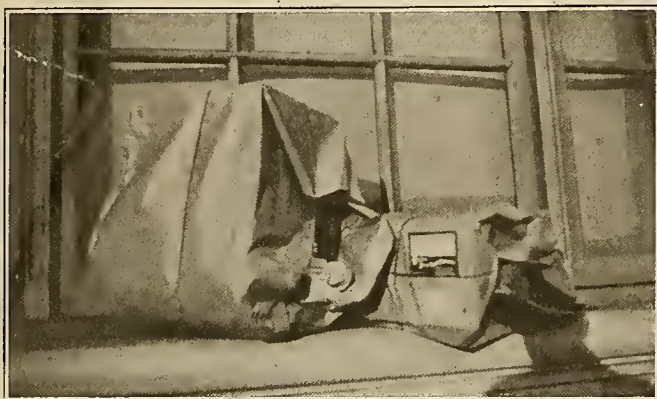
Packing for Shipment by Express

BY J. C. HARRAMAN

(A million dollars a month loss from shipments through the express company—how much of it is yours? If you have shipments go astray, it is probably your own fault, as you will be convinced after reading the following article. This interesting survey of express conditions formed part of a paper read before the San Francisco Development League. The author as claims agent with the American Express Company is familiar with the shipping practices of most electrical establishments in the West.—The Editor.)

The Express Company has seriously set itself the task of improving the express service throughout the country. The consolidated express companies operating under government control present a unified service, which can and must be efficient. The American Railway Express Company today, with the

express management in this campaign is that of claims, which are the cause of more waste in time and money, and more dissatisfaction and ill-feeling on both sides than anything else connected with the

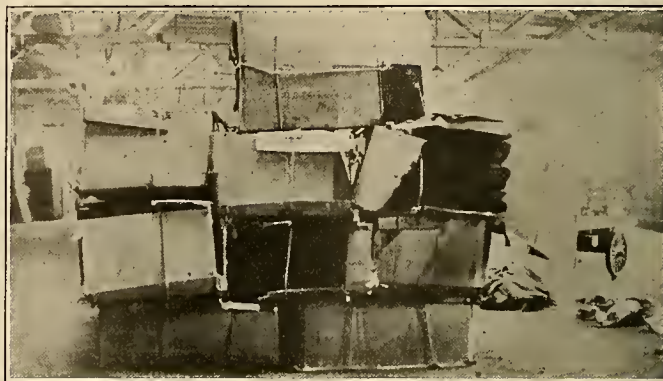


Two packages of small items which were done up in a single wrapping paper with one turn of the string about them. They should have been shipped in a box securely tied within the outer wrapper as well as without.

single exception of the post office, furnishes probably the most extensive service, territorially speaking, of any single institution in the world. It operates over 300,000 miles of railroads (using every railroad in the country) and steamship lines, maintains 35,000 offices and employs 125,000 men and women, and uses thousands of horses and wagons and motor vehicles.

Claims —

The first subject to receive the attention of the



An example of optimism. Whoever packed these heavy bundles of clothing in paper cartons and expected them to arrive in good condition was at least as trusting as some of the shippers in electrical establishments who pack heavy hardware in paper containers.

business. In the final analysis the express company has decided the best way to treat a claim is to prevent it, and that they are determined to do wherever possible.

Loss and Damage —

To give you an idea of the magnitude of the loss and damage situation which the express company faces, suffice it to say that the loss and damage account is now running over a million dollars per month, while the profits have constantly decreased



The stream of packages which passes through the hands of the express company is very large and very assorted—it is congested at certain times of the day—it must be handled to meet train schedules. It is no wonder that packages must be compactly packed and adequately protected to withstand the necessary routine handling. This is the cone—the electrically operated rotary conveyor at the Ferry Building, San Francisco, by which the lighter packages are handled.

until the company has operated at an actual deficit since the consolidation.

Theft —

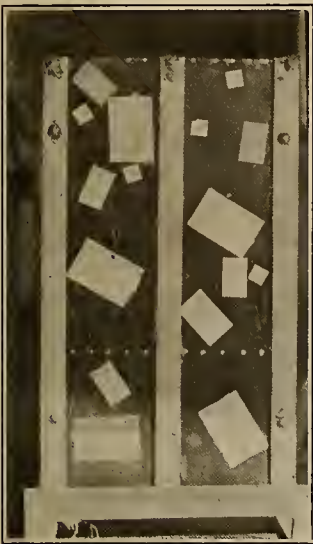
It would be useless for the express company to attempt to conceal the fact that they, in common with other transportation agencies, suffer severely through the stealing of packages, principally through operations outside their own forces. They are waging a relentless warfare on this evil. The railroad administration organized a secret service and police section under direction of W. J. Flynn, formerly Chief of the United States Secret Service, with whom the local operatives are cooperating.

Frequently the exposure of the contents of a shipment will cause a loss through theft that would not have occurred had not the exposure presented both the suggestion and the opportunity. You can assist by guarding against such exposure. Also for

all sizes, dimensions and weights. All packages cannot be loaded on top, nor can express shipments be arranged on platforms or trucks before loading in order that the heaviest express matter can be loaded on the bottom. Therefore all packages should be substantially packed to withstand the lateral pressure of the load, and the vibration of the train, whether loaded on the bottom or on top.

Second Hand Containers —

The use of old or second hand cartons or other containers is a particularly fruitful cause of claims. If these cartons or containers do not break open, they can almost certainly be depended upon to send the shipment astray on an old mark. A tracer will never locate such a shipment, for it is always traced as going to its correct destination. The express company know from experience that they have paid a great many claims on shipments of this kind. The



This trunk was not delivered to the correct address—it went clear across the continent on an address over two years old. But then, you can see the choice of destinations open to the expressman. Its owner had been traveling around the world and neglected to remove the old tags.



The owner of this chair was told to take it back and crate it before it would be accepted for shipment. Instead he sewed it up in burlap and this is what happened to it. If the express company refuses your package you may know that it is with your interest in mind.

the purpose of preventing thefts, you are urged earnestly not to place on packages labels disclosing the nature of their contents, except in the case of glass or fragile articles, in which case caution labels should be used—and in the case of liquor. In the case of glass, to inform the express employees of the nature of the contents so such packages may be handled according to their requirements, and in the case of liquor because it is obligatory by law.

Improper Marking and Packing —

If just those claims which result from improper packing, wrapping and marking of express shipments could be eliminated, the greater part of our difficulties will be overcome. In the last few years the increased cost and shortage of proper wrapping and packing materials have induced many shippers to adopt a policy of unwise economy, whereby they use inferior packing, not sufficiently substantial to withstand damage from ordinary handling in transit.

Let me explain briefly what I mean by ordinary handling in transit. The express business must be done with speed, the bulk of the shipments are given the express company in a comparatively short period of the day, everything must be dispatched promptly and loaded on cars, handled on trains scheduled to leave at definite times. Express shipments are of

fact that the shipper is not guilty of an intentional imposition on the carrier does not lessen the hardship on the company nor justify the collection of such claims.

Aside from the matter of second hand containers, the mistakes in marking shipments are legion. The mistakes of the shipping departments may be kept from the heads of the house, but they are never kept from the express company. Many of them grow into claims. If these claims are paid, the express company assumes a loss it should not bear. If they are not paid, and in all fairness they should not be, the shipper stands a loss that the exercise of care would have prevented. No matter which way the case is disposed of, both parties suffer annoyance and dissatisfaction and waste much time that could be and should be devoted to other matters.

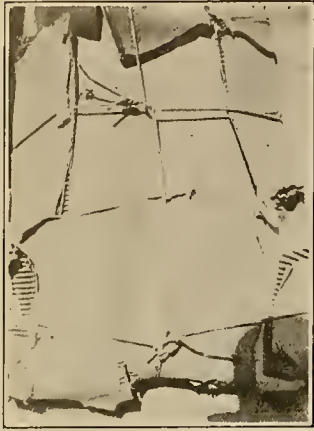
Proper Marking —

I might explain that proper marking means putting the address of both the shipper and the consignee on the outside of the package in plain and legible characters that will not rub off or become obliterated in ordinary handling. At this point permit me to urge the importance of also placing the consignee's name and address inside the shipment, particularly if it be a trunk, suitcase, valise or sam-

ple case. Many a shipment that has lost its identity or is found traveling on an old mark is identified and sent to its proper destination from information found inside it. In no conceivable situation is inside information more important or more helpful than in this.

Do Not Use Tags —

A tag should never be tied to an article when the proper marks can be written, nailed or pasted on



One of the largest electrical manufacturers in the country sent this package through a Western branch—entirely without an address. The tag which is so bravely attached at the lower knot is blank.

the article itself. All marking should be done with crayon, lamp black or ink. When it is necessary to use tags, place at least two on each article, and fasten them with wire or heavy cord, depending on the nature of the article. Wire should always be used on hardware, and in such cases the tag should have an eyelet that the wire will not cut through. This great care in the use of tags is necessary because of the ease and frequency with which they are torn off in the necessary handling, stacking and shifting of express matter.

No Advertising on Tags —

Such tags as are used should not contain advertising matter, which frequently causes shipments to go astray even when the tags are not lost, and I am sure you will agree that there is little merit if any in such advertisements. Unless unusual care is exercised, these tags put a sort of reverse English on the shipment, and turn it back to the shipper before it reaches its destination, because the names of the shipper and the consignee are transposed from their regular order.

I call to mind one instance where the Hartsook branch at Santa Rosa sent a typewriter to the Underwood Typewriter Company, San Francisco, for repairs. They addressed it 530 Market Street, which is the address of the Wholesale Typewriter Company from whom the machine was purchased. An investigation developed, however, that the shipment was not delivered to either of these but to the Hartsook main office in San Francisco, who never reported the matter.

Baggage —

With no class of shipments is correct and secure marking more important—and less frequent—than personal baggage, such as trunks, suitcases and valises. It is estimated that eighty per cent of lost baggage goes astray on old marks. The surest way to locate a lost piece of baggage is to learn between

what points it was previously shipped. No other shipments cause more serious losses than do these, and many of these losses cannot be measured or compensated in money.

An instance of this kind I think of at this time is where the Rev. Smith, a minister of the gospel, shipped from San Francisco to Carmel By The Sea five trunks—the company delivered but four. The reverend gentleman kept the wires hot searching for his lost trunk and the company could not find it by tracing. They inquired as to between what points it had previously been shipped and were very much discouraged when told he had been traveling around the world, but in this country he had visited most large cities—Washington, Baltimore, Philadelphia, New York, Boston, Utica, Syracuse, Buffalo, Chicago, Seattle, Portland and San Francisco. They searched through some 15,000 or 20,000 documents for the shipping date and found a trunk waybilled to Smith, Utica, N. Y. After wiring Utica they located Mr. Smith's trunk, which had moved on a mark two years old.

No Mark Bureaus —

As some of you have occasion to know, the express company maintains what they call No Mark Bureaus. They have nineteen of these throughout the system. In the year 1918 they found over



An entire truck load of damaged packages. This is striking evidence of the fact that most losses are due to packing heavy articles in wrappings which are inadequate. Expensive furs have been known to be sent in the flimsiest of parcels—heavy iron castings in a paper box tied with string.

300,000 shipments sent Without Mark. From July 1st to November 30th, 1918, they received in these Bureaus 127,859 shipments, an average of over 25,500 per month. While these represent but a comparatively small portion of the total shipments received in the same period, they indicate a situation that calls for drastic action, not only by the company but by the shipping public. I might add here that the express company handles approximately 300,000,000 shipments a year, an average of a million transactions a day. These Bureaus receive only shipments entirely without mark, those on which the marks cannot be made out, and those sent to destinations that do not exist. A little less than fifty per cent of these shipments are what is termed hardware, such as castings and other articles made of metal. In September, 1918, the total No Mark shipments were 26,948. Of these about 42 per cent, or

10,952, were hardware. Because of the nature of these shipments and the difficulty of describing them properly for tracing purposes, few of them are identified with claims. Most of them are sold as junk or scrap iron for practically nothing compared with what is probably paid for them in claims.

Automobile Tires —

Automobile tires or casings found without mark average about 1400 per month. Shippers too often bind several of these together with paper, or by means of flimsy crates, which will not hold them. They should be securely fastened together with rope or burlap. The marks should be securely attached, and the name and address of both the shipper and consignee should be placed inside each casing as an added precaution in case the tires become separated.

Personal Baggage —

About 1500 pieces of personal baggage find their way into these Bureaus every month. How many disappointments and blasted hopes of pleasant vacations, how many unattended parties, do you suppose these represent? And they could all have been avoided by the exercise of proper care in starting the shipment right, for none of these shipments were lost or stolen; they simply went astray because they had been turned out into a cold world without proper credentials.

The balance of the shipments received in these Bureaus embrace everything that is movable. The Bureaus are maintained at great expense, and, while they do highly efficient work in matching up shipments with claims and complaints, they represent the expenditure of time and money that should be devoted to constructive work and the improvement of service to the public.

If this condition exists with regard to marking alone, you can well understand that the losses resulting from the improper or insufficient packing or enclosing of shipments must be almost beyond comprehension. Think of the time and money that shippers must spend in handling claims on such losses, to say nothing of the time and money that they cost the company. Isn't it reasonable to say that the company could give you much better service, and that you would be much better satisfied if all could be relieved of this great burden?

Express Company Should Not Accept —

It may be urged that the express company should not accept packages that are not properly marked and prepared. That is quite true. But they have suffered along with all of you on account of labor conditions. It is part of their present work among their own men to see that they do exercise proper care in this respect, in the interest of the shipper as well as in the company's interest. You will agree with me that there is some room for improvement on both sides when I tell you that in many instances the inspectors have found some of the packages offered to the company in large quantities in shipping rooms and on the sidewalk to be not only incorrectly marked when compared with the receipts, but to be entirely unmarked.

Possibly some of you will feel that this can have no application to your own establishment. Work along this line that the express company has already done has demonstrated that too frequently the head of the house has had little actual knowledge of what goes on in his own shipping department. Many a shipper who has resented what he termed unwarranted criticism of his shipping department, or who has taken the position that his shipping force was entirely competent and dependable and that he refused to be bothered with details that he paid others to look after, has been surprised and stirred to action when the express company has finally induced him to take a personal interest in this important part of his business. Frequently they have been able to do this only by taking in at the front door what they have received at the back door. The company has no quarrel with shipping clerks as a class. They say only that they are human like the rest of us and that the proper preparation of express shipments is so necessary to a successful business that it warrants the same personal supervision by the owner of the business that he gives to buying and selling.

One important reason why express claims should be reduced that has a peculiar appeal to shippers and consignees alike is that a shipment is never made for the purpose of having it result in a claim. The prudent shipper, with an eye to future business, wants to deliver the property to the consignee; and the consignee wants that same property, intact and on time, for himself or for a customer. The payment of a claim does not satisfy either.

Tracing Shipments —

Permit me to urge the importance of not requesting the express company to trace a shipment until you have positive advice from the consignee that he has not received it. The consignee's letter, or a copy of it, should be attached to your request for a tracer. The unnecessary tracing of shipments has become a serious burden to the express business and will have to be eliminated in the interest of Better Service.

Some of you may be called upon before long to arbitrate a dispute between your shipping clerk and one of the express company's men as to whether a certain shipment is in proper shape as to packing, wrapping and marking. If you are, please bear in mind that the company's employees, in insisting that shipments be properly marked and prepared, are acting under instructions promulgated for your good as much as for the company; and please make sure that your shipping clerk is doing all that you would do personally in his place before you pronounce judgment.

A shipment is never made for the purpose of having it result in a claim.

Many a shipper has been surprised and stirred to action when the express company has finally induced him to take a personal interest in his shipping department.

The express company's employees in insisting that shipments be properly marked and prepared are acting under instructions promulgated for your good as much as for the company.

Cost of Fuel for Steam-Electric Stations

BY WILLIS T. BATCHELLER

(Every power plant must determine the fuel most suited to its particular needs and most economical to its particular situation. For the purpose of facilitating the determination of fuel costs a convenient set of curves has been worked out by a power man of the northwest and is here given with an explanation and several problems showing the method of practical application. The author is connected with the Municipal Light and Power Plant of Seattle, Washington.—The Editor.)

The unprecedented increase in the cost of the various fuels used in steam plants has made it highly desirable for companies removed from the source of fuel supply to carefully analyze the situation with a view to determining the most economical fuel for their particular location. This is true not only of proposed installations, but also of existing plants where the possible saving caused by a change of fuel should be considered. With existing plants the fixed charges including interest on the investment, depreciation, operation and maintenance, exclusive of fuel cost, are known and with projected plants they can be estimated with a reasonable degree of accuracy. It is then only necessary to add to these fixed charges the fuel cost, to determine the total cost of generation.

For more readily determining the fuel cost in any plant, curves have been prepared which may be applied to nearly any case found in practice, and from which the fuel cost may be obtained directly without making laborious computations.

Figure 1 shows the net calorific value of fuel in B.t.u. per pound with various percentages of moisture in the fuel as fired. These curves were plotted from computations based on the well known equation.

$$\text{Loss in B.t.u. per pound} = W (212 - t + 970.4 + 0.47 (T - 212))$$

Where W = per cent of moisture in fuel
 t = temperature of air in the boiler room
 T = temperature of flue gases

0.47 = specific heat of superheated steam at atmospheric pressure and at flue gas temperature.

$(212 - t)$ = B.t.u. necessary to heat one pound of water from the temperature of the boiler room to 212 degrees

970.4 = B.t.u. necessary to evaporate one pound of water at 212 degrees to steam at atmospheric pressure

$0.47 (T - 212)$ = B.t.u. necessary to superheat one pound of steam at atmospheric pressure from 212 degrees to temperature T .

Figure 2 consists of four correlated sets of curves. The first one in the upper left hand corner gives the evaporation from and at 212 degrees, with fuels having various net calorific values and with boiler efficiencies as indicated. The second set of curves shows the pounds of fuel burned per kilowatt hour generated with various values of evaporation and station economy in pounds of steam from and at 212 degrees F. per kilowatt hour. The third set shows the amount of fuel burned in thousands of pounds per hour and per day for steam-electric stations of various capacities from 1000 to 100,000 kilowatts. At the right and left sides of these curves, scales are provided for reading directly the amount of fuel burned per hour and per day, when fuel oil

and mill waste respectively are used. If so desired, the daily or hourly cost of fuel may be obtained by multiplying the quantity expressed in the desired units by the unit cost of the particular fuel used. The fourth set of curves shows this cost graphically for fuel costs per thousand pounds from forty cents to six dollars. The price per thousand pounds of coal is obtained by dividing the cost per short ton by two. For oil the price per thousand pounds is obtained by dividing the cost per barrel by 0.336 or for practical purposes, the price per barrel may be multiplied by three. One unit, or 200 cubic feet, of mill waste weighs 3600 pounds, so the price per unit must be divided by 3.6 to determine the price per thousand pounds.

Problem 1. Fuel Oil.

With fuel oil having a net calorific value of 18,500 B.t.u. per pound, costing \$1.00 per barrel, what will be the cost of

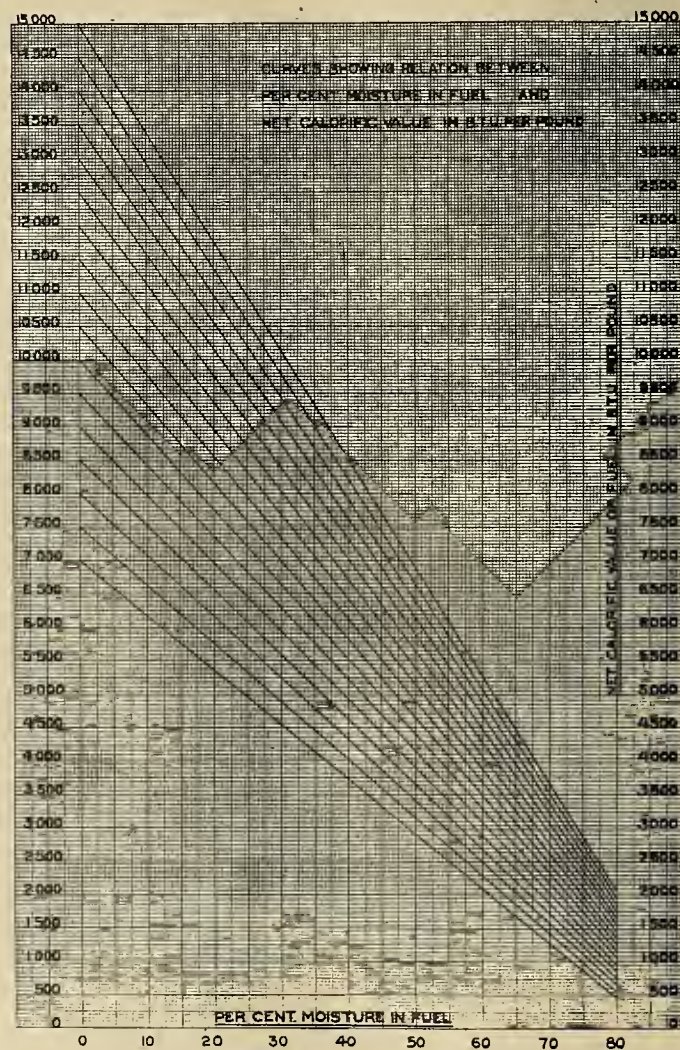


FIGURE 1.

The net calorific value of fuel in B.t.u. per pound with various percentages of moisture in the fuel as fired.—Figure 1.

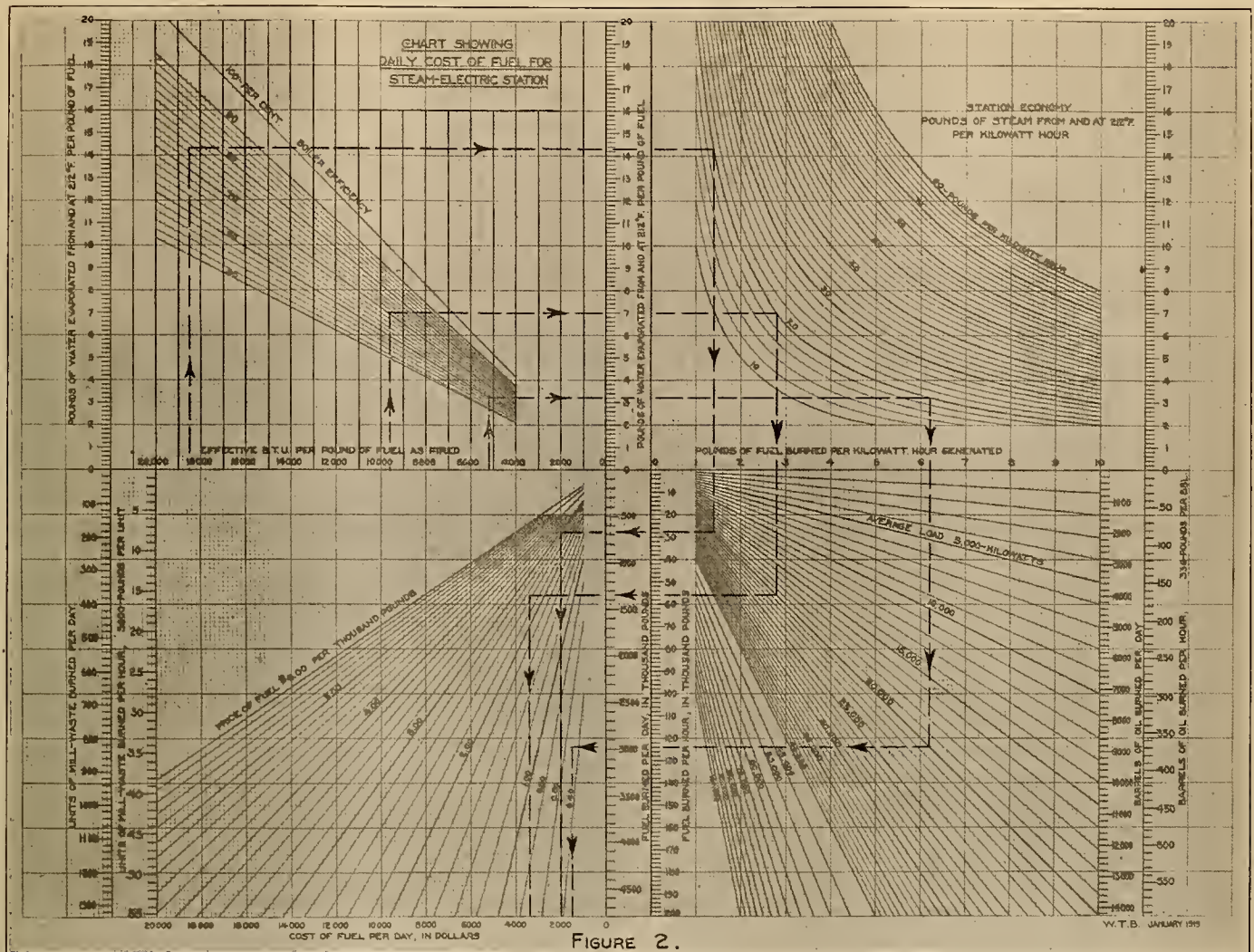


FIGURE 2.

Four correlated sets of curves. Upper left hand corner—the evaporation from and at 212° with fuels having net calorific values and with boiler efficiencies as shown. Upper right—the lbs. of fuel per kw-hr. with various values of evaporation and station economy. Lower right—amt. of fuel burned per hr. and per day for steam electric stations of various capacities. Lower left—the cost for fuel per 1000 lbs. from 40 cents to six dollars. See text for methods of using curves.

fuel per day in a steam-electric station of 20,000 kilowatts capacity, having an average boiler efficiency of seventy-five per cent, and an average steam consumption per kilowatt hour of twenty pounds of steam from and at 212 degrees F.?

Starting at 18,500 B.t.u. on Figure 2, follow the vertical line to the 75 per cent. boiler efficiency point and obtain an evaporation of 14.3 pounds of steam from and at 212 degrees F. on the horizontal line. Follow the horizontal line until it intersects the 20 pounds station economy curve and drop vertically. The pounds of fuel per kilowatt hour generated are shown to be 1.4 pounds. Continuing down the vertical line to the 20,000 kilowatt load line, turn to the left and find the fuel per hour to be 28,000 pounds or about 670,000 pounds per day. As the fuel considered is oil, the horizontal line may also be followed to the right hand scale and the amount per hour and per day will be found to be 83 barrels and 2000 barrels respectively. As the price is \$1.00 per barrel, the above numbers of barrels represent the fuel cost per hour and per day directly. To illustrate the procedure for other prices of oil, follow this same horizontal line to the left until it intersects the line representing a price of \$3.00 per thousand pounds which corresponds approximately to \$1.00 per barrel. Then drop vertically to the lower scale and read \$2000.00 per day, the cost of fuel.

Problem 2. Coal.

With coal containing 15 per cent moisture and having a calorific value of 11,500 B.t.u. per pound of dry coal, and

costing \$5.00 per short ton, what will be the cost of fuel per day in a steam-electric station of 20,000 kilowatts capacity, having an average boiler efficiency of seventy-five per cent and an average steam consumption per kilowatt hour of twenty pounds of steam from and at 212 degrees F.?

On Figure 1, start at 11,500 B.t.u., go down the diagonal line to the line representing 15 per cent moisture and read 9,600 B.t.u. net calorific value. On Figure 2, start at the 9,600 B.t.u. point, follow the vertical line to the 70 per cent boiler efficiency line and continue on the horizontal line to the intersection with the 20 pounds station economy curve. Drop vertically to the line representing 20,000 kilowatts and turn horizontally, intersecting the line for \$2.50 per thousand pounds. Drop vertically to the lower scale and read \$3,400.00, the daily cost of fuel.

Problem 3. Mill Waste.

With mill waste containing 30 per cent moisture, having a calorific value of 8,000 B.t.u. per pound of dry fuel, and costing \$1.80 per unit of 200 cubic feet weighing 3,600 pounds, what will be the cost of fuel per day in a steam-electric station of 20,000 kilowatts capacity, having an average boiler efficiency of sixty per cent and an average steam consumption per kilowatt hour of twenty pounds of steam from and at 212 degrees F.?

On Figure 1, start at 8,000 B.t.u., go down the diagonal line to the 30 per cent moisture line and read 5,250 B.t.u. net calorific value. On Figure 2 start at the 5,250 B.t.u. point,

follow the vertical line to the 60 per cent boiler efficiency line, continue along the horizontal line to the intersection with the 20 pounds station economy curve. Drop vertically to the line representing 20,000 kilowatts and turn horizontally, intersecting the scale at the extreme left of the sheet. The amounts of mill waste per hour and per day are found to be 34.4 units and 826 units respectively. The cost at \$1.80 per unit may be computed or it may be obtained from the curve by transforming the cost per unit to the cost per thousand pounds by dividing by 3.6, giving \$0.50 per thousand pounds. The intersection of the horizontal line with the fifty cent line gives the cost per day of \$1500 on the lower scale.

Problem 4. Equivalent Prices.

With the above fuel prices and operating conditions, what must be the prices of coal and oil to equal the price of \$1.80 for mill waste, based on fuel cost only?

On Figure 2, project the line representing \$1500 fuel cost per day for mill waste, until it intersects the horizontal lines for oil and coal. Read at these intersections the prices per thousand pounds. The equivalent price of coal is \$1.10 per thousand pounds or \$2.20 per ton and of oil is \$2.20 per thousand pounds or \$0.66 per barrel. This is correct for a comparison of fuel costs only and also for the entire operating expense where the fixed and operating charges are the same for the three kinds of fuel. For other cases, the variation in these fixed charges should be considered. With a certain total daily generating cost for one fuel known, the sum of all charges excepting fuel cost for a second kind may be subtracted from the first total, leaving the amount available for purchasing the second kind of fuel. This fuel cost may be used as the starting point on the bottom scale of Figure 2 and this line projected upward to the intersection with the horizontal line for the first fuel as in Problem 4.

In case it is desired to obtain the daily fuel cost for a plant smaller than can be readily read from the capacity curves, the actual capacity may be multiplied by 10, 100 or 1000 and the final result divided by the same factor, thereby facilitating the operation.

PELTON REACTION TURBINES IN PAPER MILL POWER HOUSE

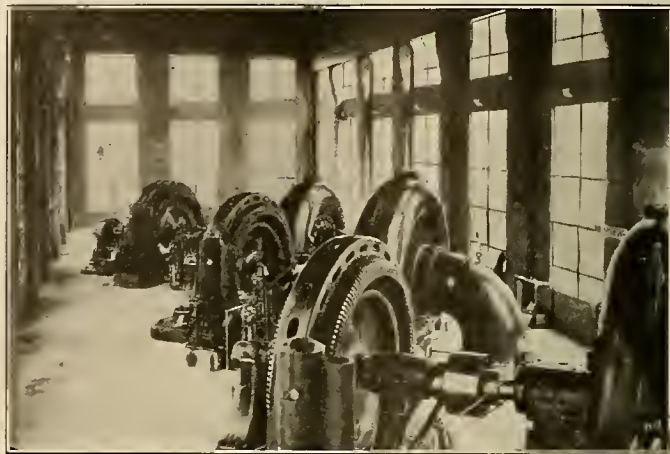
(Additional data on the interesting mill installation described in the *Journal of Electricity* for March 15 are here given which bring the record of equipment up to date. The Northwest has particular advantages of location for lumber and paper enterprises such as this, in the close proximity of the raw material to the water power and of both to the shipping facilities.—The Editor.)

The hydraulic equipment in the present power house of the Ocean Mills Plant of the Pacific Mills, Ltd., consists of three Pelton reaction turbines, direct driving alternating current generators. Two of the turbines are of the single discharge type, the runners being mounted on the overhang of the shaft, which is supported by a massive combined main and thrust bearing. Each shaft, in turn, is direct coupled to a generator; thus, each generating set forms a three bearing, coupled type unit. The third turbine is of the double discharge, two bearing type, direct coupled to an alternator.

A 12 ft. diameter riveted steel pipeline about 550 ft. in length, conveys water to the power house; the latter is designed for housing additional generating capacity. Owing to the variable water head conditions prevailing, the turbines were designed to afford as flat an efficiency curve as possible, over a range of heads from 106 ft. to 143 ft.; the speed of

rotation being constant to suit the 60 cycle periodicity of the system.

Each of the single discharge turbines are of nominally 2100 h.p., 225 r.p.m., but under the maximum head conditions developed an output of approximately 3400 h.p. The double discharge turbine was designed to develop 3200 h.p. under minimum head conditions, and 4500 h.p. at 360 r.p.m. under maximum head. In order that the pressure fluctuations in the 12 ft. diameter penstock could be limited to a



Interior of the present power house, showing the three Pelton reaction turbines direct connected to alternating current generators

predetermined amount, each of the spiral encased turbines was provided with a special governor actuated relief valve, having a slow closing feature. Thus, with a rejection of a large amount of power, the governor, in readjusting the position of the turbine wicket gates, would open the relief valve; the latter remained in a discharging position for that period of time only, as is necessary to prevent pressure waves occurring, after which each relief valve automatically and slowly closed to effect water economy. The time of closure is adjustable, and is controlled by means of an oil dashpot, interposed between the relief valve proper and the governor.

Under certain conditions of operation, it is essential that the relief valves act as synchronous bypasses, opening and closing inversely to the movement of the turbine wicket gates. An adjustment is provided whereby this result is accomplished.

The combined discharging capacity of the three relief valves is in excess of 465 sec. ft., under approximately 106 ft. head. At a future date, especially when the additional generating capacity is installed, it is expected that the operating characteristics of the plant will be such that the load fluctuations will be more severe than under the present conditions; accordingly, provision has been made in the design of the couplings, whereby heavy flywheels may be introduced without changing the setting of the generator or turbines.

A distance piece 4 in. in thickness is now interposed between the coupling valves, and by removing this, together with the shaft of either the generator or turbine, the flywheel may be bolted in place, involving the minimum shut-down.

The Business Library

BY LOUISE B. KRAUSE

(Technical magazines are the best source of up-to-date data in your field—are you making the best use of them? Methods of selection, of indexing and filing so that the magazine may be of the greatest use to the greatest number in the organization are here suggested. This is the fourth in a series of articles on the Business Library being written for the Journal of Electricity by the librarian of H. M. Byllesby & Company, Chicago. Attention is called to the copyright and the necessity for obtaining permission before reproduction.—The Editor.)

PERIODICALS IN THE BUSINESS LIBRARY— HOW TO USE AND HOW TO FILE THEM

The Value of Periodicals

Periodicals are the most fruitful source of information for any business, and there is periodical literature of value being issued constantly on every conceivable subject. Every industry and profession has its journals and in them will be found the latest and best information.

The value of periodicals in a business organization was very ably stated some time ago by the secretary of an electrical association, and as this testimony is not from a librarian but from a prac-

news from the national capital, can be pretty well assured that he has every tip that could come to him via the intelligence office, that asks a fee of fifty or one hundred dollars per annum. Indeed, it has happened, not once but dozens of times this past year or two that business journals, etc., carried information days and even weeks before it was sent out in the mimeographed 'letters' and 'bulletins' which the former bureaus distributed, marked 'confidential' and 'not for publication.'

The Contents of Periodicals

Not only do periodicals contain lengthy articles on special subjects, but every item in them from cover to cover is of value; for example, in engineering periodicals the business library is greatly aided by the current news notes on books, pamphlets, meetings and people; information on state and federal legislation; prices of materials and second-hand material for sale or wanted to purchase, new construction notes, new devices and best makes of standard supplies.

The brief notes found in current periodicals, announcing the publication of trade pamphlets, reports of state boards, special committees, private corporations and bulletins published by universities, lectures delivered at colleges and papers presented at state meetings of associations, are most valuable guides in collecting pamphlets, which although in many cases may be had for the asking, represent a collection of valuable data which can not be replaced by the expenditure of any amount of money and yet most of it costs only a polite letter of request.

Aids in Selection of Periodicals

The business man or the business librarian will first of all desire to select the periodicals that best cover the needs of his organization. If he wishes to ascertain the titles of periodicals on special subjects in order to obtain sample copies for examination, or if he has the title and wishes to find the frequency of issue, the place of publication and subscription price, there are several books that give such information and which should be found in the public library of his city. It is advisable also for him to see a list of all periodicals which are on file at his public library with a view to examining those which may be suited to his immediate needs. The following books will give information about periodicals on special subjects.

Ayer & Sons' American Newspaper Annual Directory, published by N. W. Ayer, Philadelphia, \$5.00.

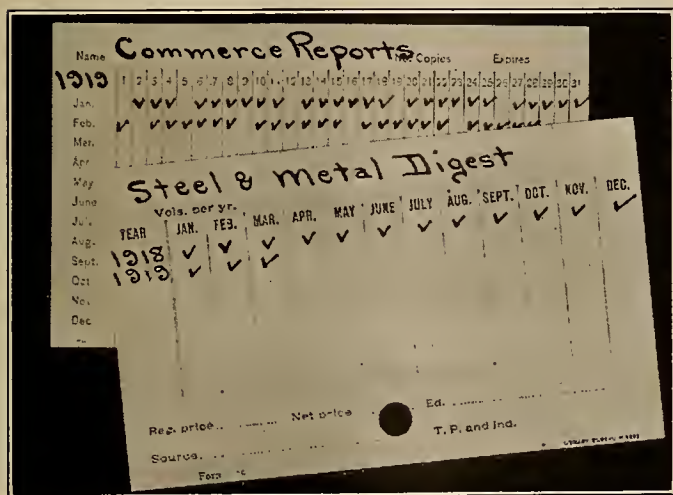
1600 Business Books, published by H. W. Wilson Company, New York, 1917, price \$1.50.

Severance Guide to the Current Periodicals and Serials in the United States and Canada. A new edition will be published shortly by George Wahr, Ann Arbor, Michigan, price \$5.00. This new edition will contain a list of House Organs published in the United States. A recent list of House Organs may be found in Printer's Ink, August 29, 1918, and subsequent issues.

A list of periodicals published by the United States Government can be obtained free of charge from Superintendent of Documents, Washington, D. C.

The Checking of Periodicals

The care of periodicals is one of the important pieces of work which consumes a large portion of the



Check cards on periodicals which enable the librarian to know if all copies to date have been received. On the back is noted the date of renewal of the subscription.

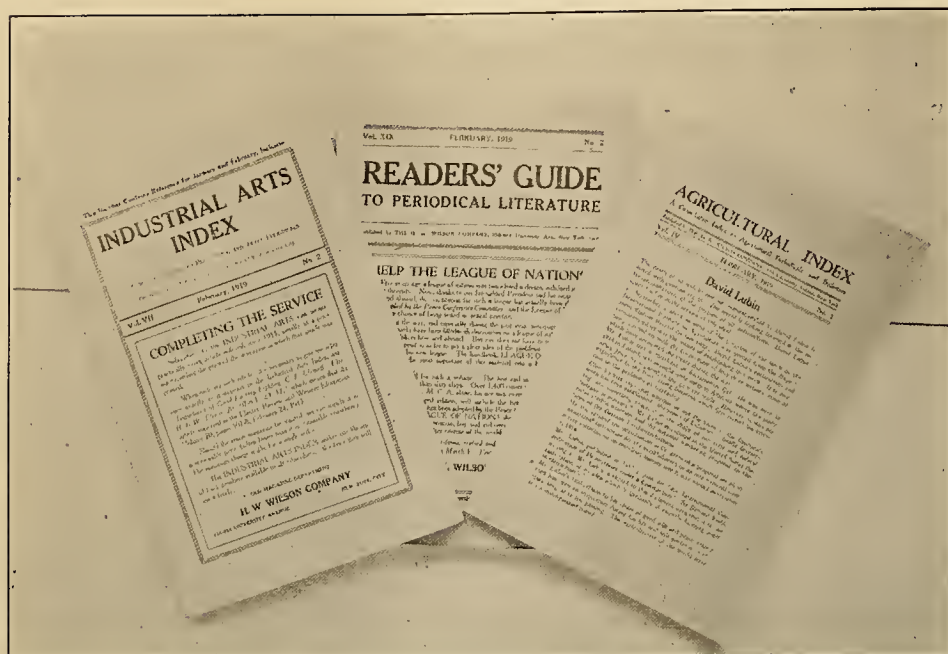
tical business man, it seems worth while to quote as follows:

"The technical or trade journal of today is the liveliest and most 'up-to-now' assistant a business man has. It is carefully edited, well-printed, fully illustrated and thoroughly indexed both as to literary matter and advertisements. It is the 'always ready reference' of the minute, and the official, head of a department, or even workman, who does not use it to its fullest capacity, is neglecting one of his best friends. I have been surprised to find how many of the larger companies are actually stingy when it comes to paying out money for subscriptions to their trade and technical journals. They talk about one, two or three dollars per year as if it were that many hundreds; they look at the expenditure as if it were an expense instead of an investment, which, properly handled, will bring good returns.

"In no other way can any business man, no matter how high or low his position, keep so fully abreast of the times in his business as by early and careful perusal of his trade and technical periodical, from its front to its back cover, and from no other source can he obtain the 'immediately useful' so well as he can from a well filled and indexed present volume of those same publications."

"Printer's Ink" has also stated the case as follows:

"The manufacturer, desirous of keeping his finger on the pulse at Washington, who will spend ten dollars, or fifteen dollars, or twenty dollars a year for business papers and other periodicals that specialize with respect to business



These indexes of periodicals which are published by H. W. Wilson Company are of the greatest use to the business library—but should be supplemented by a subject index within the library itself which will have special reference to the company's interests and will cover items of importance too short to be listed in the published records. When unforeseen requests arise, however, the printed index performs an invaluable service.

business librarian's time. All periodicals received by the business library are stamped, as soon as the mail is opened, with the word "Library" and the name of the firm, and checked on monthly or weekly card records, size 3 by 5 inches, specially ruled for the purpose and obtainable from library supply firms. This card record enables the librarian to know if all copies to date have been received and on the back of the card also provides a record of expirations and renewals of subscriptions.

The Indexing of Periodicals

After the periodicals are checked, the librarian should go through them rapidly, keeping well in mind all the topics of particular interest to the organization, and also special requests from individuals for the latest information on subjects; which they have designated as being of present value to them. It is a good plan also to ask heads of departments who read periodicals regularly every week, to call the attention of the librarian to any special articles which they think valuable and to which they might wish to refer again. This strengthens the librarian's reading and makes doubly sure that no information of importance is overlooked.

All articles or items of importance are assigned a subject heading (which will be discussed in the article on cataloging), and a card is made for the subject card index to periodical material.

Some one may ask at this point why it is necessary for the librarian to do subject indexing to periodical articles when there are good printed indexes to them, such as Readers' Guide to Periodical Literature, Industrial Arts Index, and the Agricultural Index, published by H. W. Wilson Company, New York City (samples and prices upon application) and in addition The Engineering Index, recently acquired by the American Society of Mechanical Engineers and published monthly in the Journal of that Society. There are several reasons why subject indexing must be done by the librarian; first because these printed indexes do not index many of the periodicals which are of importance to the busi-

ness library and second, because in the periodicals which are covered by these indexes, there are many items of importance to business firms which are too short to be entered in the general printed indexes. The time element is also an important factor in the business library, as the subject card index is made at once and immediately ready for reference, while the printed indexes are of necessity never strictly up to date. For example, an engineering firm was desirous of keeping up to date on all increases in gas and electric rates throughout the country, due to the increased cost of production, on account of higher prices of materials. Various journals reported such items each week, sometimes in not more than a dozen lines. In such a case the librarian's minute reading and quick indexing was invaluable, and gave a service not to be expected of the printed index.

A word should be said, however, at this point in regard to the value of printed indexes, for example the "Industrial Arts Index." Periodicals are sealed books without indexes, and printed indexes are invaluable working tools, first, because no business librarian will attempt the impossible task of making a subject card for every article of value in current periodicals, and second, because a live business organization in these days of sudden changes in economic conditions cannot possibly foresee every subject in which it may be interested. When these unexpected subjects arise for which the business librarian has not made provision, the printed indexes come to the rescue and serve the need most admirably. The indexes to separate volumes of individual periodicals, which the publishers issue at the completion of each volume, and in many cases do not send unless requested to do so, are not of great value because, with few exceptions, the subject indexing is poor. Many of them invert the title of the article in order to enter it under the most striking word which it contains, without consideration of its real subject content, and without further consideration of the three, four or more subjects on which the article is very likely to contain valuable information.

Coronado Conventions

(The Coronado Joint Conventions in retrospect appear as the most successful in the history of the Pacific Coast Section, not merely in point of numbers attending but also as to ideals realized and plans made for future endeavors. That this notable gathering set such a high mark is largely due to the efforts of the Section officers and the general convention committee with its various sub-committees, to whom too much credit cannot be given.—The Editor.)

The third annual convention of the Pacific Coast Section N. E. L. A. was the largest and most representative yet held. Convening at the same time and place as the jobbers and contractor-dealers associations, it had the advantage of their numbers in swelling the total registration above the five hundred mark and of bringing to its counsels their advice and experience. Furthermore, representatives of many eastern manufacturers were present, as well as the officials and department heads of central stations throughout the West.

Though President W. F. Wells of the National Association telegraphed his regrets at his inability to be present, the national body was ably represented by Vice-President R. H. Ballard and R. S. J. McClelland, chairman of the hydro-electric and engineering section.

"THE MAN IN THE STREET"

Aside from the discussions of the engineering and commercial papers printed elsewhere in this issue and the report of the Public Policy Committee, the outstanding feature of the convention was S. M. Kennedy's paper, "The Man in the Street," as printed in the May 1st issue of the Journal of Electricity. In the words of John A. Britton, it pointed out that "the public has a right which has to be recognized." "We should take ourselves from the pedestal of a public utility to the level of a merchandizer trying to sell his services."

In his discussion of the paper R. H. Ballard stated that public good-will is based upon public respect, which may be gained by following the lines indicated by Mr. Kennedy. He cited the service given by express companies and the attitude of their employes under federal operation as typical of what might occur in the central station field under municipal ownership. Whatever it may cost the power companies to bring public realization of these facts and of the benefits of private operation would, in his opinion, be money well spent and would ultimately be reflected in the net result of the operating report.

A. E. Wishon, in discussing the paper, emphasized the value of well-appearing properties and equipment in facilitating bond sales among consumers, whom he considers as most desirable investors. T. E. Bibbins laid stress upon the benefits resulting from personal contact of managers with the employes and the public. He also assured the support of the trade in aiding the power companies in their efforts to develop favorable public consideration of the power companies. Ed. Whaley explained how the substitution of "can't" for "won't," with explanation of the reasons why, had invariably led to better satisfied customers.

THE GOODWIN PLAN

W. L. Goodwin addressed a general meeting on Friday afternoon with regard to the betterment of the entire electrical industry that may be accomplished through the Goodwin plan.

VISIT TO AVIATION FIELD

On Friday morning the electrical men and their wives were the guests of Col. H. H. Arnold, commanding officer at Rockwell Aviation Field, North Island, the trip from the Hotel del Coronado being made in autos. The visitors were taken through the shops and hangars and given a demonstration of wireless telephoning to and from airplanes. An aerial circus was staged by a number of the aviators who performed many spectacular evolutions.

Many of the guests also accepted the invitation of Lieutenant R. T. Strong to inspect the U. S. S. Marblehead on Sunday.

ENTERTAINMENT FEATURES

The beautiful environs of San Diego lent themselves admirably to the entertainment of the ladies and other guests by means of automobile rides during the daylight hours. Through the courtesy of the moving picture producers interesting films were shown on Wednesday evening, the association also being favored by dancers from the Liberty Theatre at Camp Kearney. Dancing was enjoyed each evening throughout the convention period.

Outdoor sports of all kinds were provided for those so inclined. Handsome prizes were awarded the winners in various tennis, golf, swimming and bowling contests.

THE BANQUET

The climax of the convention was reached at the banquet on Friday evening, and too much credit cannot be given the committee having this affair in hand. The main event of the evening was the address by E. O. Edgerton, President of the California Railroad Commission, who urged the public utility men of the state to do their best to prove the case of private ownership as against public ownership, expressing meanwhile the belief that the men of California's public utility corporations were of such caliber as to make that case good. His address will be printed in full in these columns in an early issue.

Mr. William C. Clayton, vice-president and director of the Spreckels' interests, was toastmaster. The banquet opened with the singing of "America" and a toast to the President of the United States.

The main dining room of the hotel was beautifully decorated for the occasion with the flags of all nations and elaborate electrical effects were installed, including a complete wireless station from which humorous messages were flashed during the progress of the dinner.

One of the most amusing skits of the evening was the "Passing of the Spirits," which proved to be the burial of John Barleycorn. A huge papier mache bottle formed the bier of the lamented John. This was borne into the banquet room by somber-clad pall bearers, preceded by a Puritan-like funeral director impersonated by Secretary A. H. Halloran, who delivered a funeral oration cleverly parodying Shakespearean stanzas. At this stage of the proceedings a wireless message was flashed that President Wilson had rescinded the order for prohibition, which was the signal for the cork to pop and liberate colored balloons and confetti, John Barleycorn coming to life from the interior of the bottle and delivering Eugene Field's "A Cold Bottle and a Bird," B. T. Robley taking the part. The wireless also brought forth from beneath the bier a number of ballet dancers who gave a bacchante dance until interrupted by a second wireless message that the President had not rescinded prohibition, whereupon John subsided into the bier bottle and the cortege mournfully made its exit to the strains of Chopin's "Funeral March."

During the course of the evening there were also songs by William Proctor, a demonstration of the powerful voice reproduction by the Magnavox, and community singing. The dinner was concluded by the band from the naval air station marching to the speaker's table and playing the "Star Spangled Banner."

BUSINESS SESSIONS

The opening session of the convention was marked by the introductory addresses and routine business.

President Samuel H. Kahn reviewed the work of the year and made important recommendations for the coming year. Reports of the Secretary and Treasurer then followed reviewing the state of the society—and reports from the various standing committees.

The membership committee reported that the association had held its own during the past year. Comparative membership figures are given as follows:

Class of Membership	April 1918	April 1919	Decrease	Increase
A	41	33	8	
B	529	534		5
C	5	5		
D	54	20	34	
E	71	84		13
	700	676	42	18

Reports and recommendations were made by the Engineering and Commercial Committees and the Committee on Cooperation. This was supplemented by a brief report from the Advisory Committee of the California Electrical Cooperative Campaign which gave a brief review of the accomplishments of the past year and plans ahead.

The Publicity Committee, in a report presented by Ed. Whaley, briefly outlined their plan for the establishment of a clearing house of public relations under the Public Policy Committee. The Executive Committee did not feel warranted in December, 1918, in authorizing the further prosecution of the work as planned and it was proposed to bring the matter up at this convention. The executive committee, however, arranged with A. H. Halloran to prepare a series of fourteen "Public Service Talks." The Publicity Committee recommended that the necessary steps be taken to carry out this plan in full.

The Public Policy report presented by John A. Britton was presented on the last day of convention proper and is given in full elsewhere in this issue.

Among the resolutions passed by the convention was one recommending the study of the subject of railway electrification by the Engineering Committee with a view to the conservation of fuel oil. The question of national committee appointments was further considered and recommendation made that the chairmen of the National Engineering Committees make their appointment of committees relative to the Pacific Coast Section after considering the recommendations of the chairman of the Engineering Committee of this section.

Disapproval was expressed of the proposed establishment of a standard of ethics by the Bureau of Standards at Washington as in some measure overlapping the province of the railroad and utility commissions.

The discontinuance of the use of lighting sockets for electric appliances and the instigation of a campaign educating the public to the evils of this use was unanimously urged. The establishment of a Bureau of Public Relations under the direction of the Public Policy Committee was also determined upon.

Felicitations to the North, an expression of confidence in the California Electrical Cooperative Campaign, an extension of the spirit of cooperation to Pacific neighbors and thanks to hosts were the subjects of further resolutions.

The following resolution of thanks was tendered the Journal of Electricity:

Whereas, The Pacific Coast Section N. E. L. A. in convention assembled desires at this time to extend to the Journal of Electricity its full appreciation, not only for the very great support that publication has given the Section at all times, but more particularly so at this time, first in the publication of the special issue of the Journal containing the papers which have been presented and the forwarding of a copy of such issue to all members of the Section, and which action has not only enabled us to conduct our meeting in a more expeditious manner, but also has made it possible for the discussion of the several papers to be more to the point than it would have been had not the papers been printed in advance; also for the further spirit of cooperation in the publication and distribution of the Service issue containing matters of interest to those in attendance upon the convention;

Therefore Be It Resolved, That it is the sense of this convention that a vote of thanks be extended to the Journal of Electricity for the material help which it has been to our Section, and more particularly to the upbuilding of our industry as a whole in the West.

The newly elected officers for the coming year are:

President—A. E. Wishon, San Joaquin Light & Power Corporation.

Vice-President—E. R. Davis, Southern California Edison Company.

Vice-President—Lee H. Newbert, Pacific Gas & Electric Co.

Secretary—A. H. Halloran, Journal of Electricity.

Treasurer—J. F. Pollard, Sierra & San Francisco Power Co.

EXECUTIVE COMMITTEE

Arizona—R. S. Masson, Pacific Gas & Electric Company, Phoenix; Arizona Power Company, Prescott.

Nevada—Geo. A. Campbell, Truckee River General Electric Company.

New Mexico—C. M. Einhart, Roswell Gas & Electric Co.

Jobbers—C. C. Hillis, Electric Appliance Company.

Contractor-Dealers—Frank Somers, Century Electric Co.

Manufacturers—E. O. Shreve, General Electric Co.

Central Stations—Wm. Baurhyte, Los Angeles Gas & Electric Corp., Los Angeles; Henry Bostwick, Pacific Gas & Electric Co., San Francisco; S. M. Kennedy, Southern California Edison Co., Los Angeles; A. B. West, Southern Sierras Power Co., Riverside; Samuel Kahn, Western States Gas & Electric Co., Stockton; J. B. Black, Great Western Power Company.

THE PRESIDENT'S ADDRESS

President Samuel H. Kahn, during the course of his introductory address, presented the following survey:

The outlook of the Pacific Coast Section of the National Electric Light Association at the close of its Second Annual Convention in May, 1918, did not seem promising as all of us were absorbed—some to a greater extent than others—in the common work of cheerfully performing a service for our country, that needs no elaboration on my part. An active, keen interest in the Association affairs could but indifferently command our attention. Since the middle of November, 1918, however, Association work was given the notice that under ordinary circumstances it would have merited had world conditions been normal and even though the time from then until now has been relatively short, not a little has been accomplished, due to the earnest efforts of your Executive Committee and various Committee men. Such work as has been initiated by the Commercial Committee, Engineering Committee, Publicity Committee and other committees should receive the profound consideration of the ensuing administration and it is hoped that it will enlarge, amplify and expand upon the measures inaugurated.

The Financial Situation—

The financing of the Association is one which has commanded considerable attention during the past year and one which deserves serious thought in the future. At the present time the Pacific Coast Section receives as a refund from the parent organization of the National Electric Light Association one-half of the fixed or stated dues and none of the percentage dues. It is estimated that the refund from the National Association this year will be approximately two-thirds of our budget and while we have ample funds to provide for the 1919 expenses, an apparent deficit must be faced by the end of 1920 unless the National Association remodels its plan of financing its Geographic Sections without increasing the present rate of dues paid by members of its Geographic Sections. Undoubtedly all of us are in favor of National organization so long as National organization co-operates with us to the extent of permitting us to exist on a healthy basis. If, however, the National Association limits our finances to a point where we are unduly curtailed in the performance of the duties and investigations incident to the

successful maintenance of such an important Geographic Division as ours, we must then devise ways and means to modify this condition. None of us are anxious to take initiatory steps that would even partially disturb our present relations with respect to the National Association, yet a different form of organization is foreseen unless we are given the recognition and assistance that we believe we merit.

Decrease in Membership —

The membership of the Association has decreased to an alarming degree, this statement being generally true with respect to all classes of members with the exception of Class E. Upon comparing the membership of the several classes at the present time with the membership in 1917, we find that Class A members show a decrease of 35 per cent, due to consolidations, and consequently this decrease is more apparent than real; Class B members a decrease of 57 per cent; Class C members—no change, that is no increase or decrease; Class D members a decrease of 41 per cent, and Class E members alone show an increase of 30 per cent. The combined membership shows a decrease of 52 per cent. The reason for the greater part of decrease in membership of Class B is readily understood, and in fact is complimentary to the manhood of the Association for it indicates the goodly number of our members that enlisted in the country's cause. The decrease in Class D members is likewise understood, for many of this class put their business aside and entered the ranks. It is hoped and believed that these two classes of members will return to the fold. Generally speaking, however, the Association work must be made more attractive to Class B and Class E members, for the greater number of this membership are not afforded the opportunity of attending conventions and participating in convention work and we must, therefore, devise ways and means to hold their respect and interest if we expect this membership to show material increase. You will observe that the comparison of membership of the present time has been made with that of 1917—two years ago, so in justice to the Association and its membership committee, I am pleased to announce that the membership of 1919 as compared with 1918 is found to be approximately the same.

Program of Water Power Development —

The Pacific Coast is blessed with an abundance of water that might be used for the generation of hydroelectric energy provided Congress enacts laws that would encourage and foster work of such constructive nature. Continued propaganda for the education of the public should be the order of the day and the Publicity Committee should exert unceasing effort to let the people of the Pacific Coast know of its handicap due to the shortage and consequent high price of fuel, coupled with the difficulty incident to putting to beneficial use the tumbling waters of wild mountain streams now running to waste. The Pacific Coast cannot come into its own as a manufacturing district until we have more cheap power to distribute and the demand at the present time is even more insistent than it was five years ago, for within that length of time many new uses for electricity as a substitute for fuel have become common and when such substitution takes place it usually requires large blocks of power. This is notably true with the electric furnace for the production of steel castings. Not so long ago a statistician compiled figures to indicate that the number of kilowatt hours sold increases more rapidly than the square of the population; in other words, if the population is doubled, the energy consumption is more than quadrupled; therefore, if the population of the Pacific Coast doubles within the next ten years, the use of electricity will be four or five times as much as at present. Figures recently published by the Bureau of Census, Department of Commerce, indicate that the Central Stations of California during the year 1917 generated 2,746,000,000 kilo-

watt hours of electric energy as against 661,000,000 kilowatt hours in 1907, an increase of 315 per cent, whereas the population of California increased during that ten years less than 60 per cent. These figures bear out the statement regarding the consumption of electrical energy and should be instilled in the minds of every thinking man and woman. They must come to realize that the solution and responsibility of furnishing this energy rests with men trained to that particular industry, as these are in a position to render that service, taking all factors into consideration, at less cost than a governmental agency. Here also the Publicity Committee has a fertile field within which to work, for it must teach the people that a most important task may be properly delegated so that they may enjoy all of the benefits that would accrue to them under municipal ownership without the attendant evils of municipal ownership. Supplementing such educational work, member companies of the Association can further strengthen their position by the popular sale of securities such as preferred stocks to the people whom they serve. Some of the companies have already done this and it is to be hoped that other companies will be able to do likewise when the opportunity presents itself. We must bear in mind that this is an era of reconstruction in its broadest terms, and the people are thinking along different lines. The time to mold public opinion is now, and if teaching the people that their problems are ours and that in the last analysis our burdens are theirs, we will continue to administer a public trust that from a social and economic standpoint can best be directed in private ownership. The Publicity Committee has outlined an extensive program that was given the approval of the Public Policy Committee and Executive Committee, and the initial work has been started.

Electrification of Railroads —

The ever broadening market for electrical energy presents some unique and complicated problems involving standardization of apparatus and system. One of the most important uses of energy that has passed the experimental stage and now promises to come into practice is that of electrification of steam railroads. This measure which has received the attention of our Engineering Committee in a preliminary way must be given persistently our best thought, as it is one of the most important measures that this committee has before it. Other work, however, of equal importance is the system of inter-company connections, as I believe that the time is not far distant when a bus bar, so to speak, will extend from Northern to Southern California. In Northern and Central California, during the summer and fall of 1918, inter-company connections proved their effectiveness in partially relieving the serious situation caused by shortage of hydroelectric power due to small precipitation in the high Sierras during the 1918-1919 season.

The Question of Rates —

In passing I want to remark that the Public Utility Commissions of the Pacific Coast, and particularly California, performed a signal service during the past twelve months in raising the rates chargeable to the public by central stations and in taking such action they performed meritorious service not only to central stations but to the public as well, for the slight increase in rates permitted the public utility companies to continue to render their high standard of service and to make extensions and improvements which the increase due to ordinary growth required and the increase due to war conditions demanded. It is refreshing to observe that the public made comparatively little or no protest to the action of the Commission in raising rates, which in itself is a wonderful tribute to the Commission, for the people had come to realize that the Commission was worthy of their confidence and that if the rates were raised they were done so in justice and equity to all concerned. While some of us in the past may

have chafed at times under Commission regulation it is to be hoped that this regulation in competent hands, such as we have enjoyed in California, will be with us for all time to come and that if any change is made in the Public Utilities Act, under which the Commission operates, it will be a change that will broaden the Commission's powers instead of curtailing them, including among other things Commission regulation of municipally operated public utilities.

Cooperation —

The four branches of the electrical industry, namely, the

Manufacturer
Jobber
Contractor-Dealer
Central Station

have worked closer together than ever before and the spirit of cooperation manifested is worthy of special mention. Each branch has come to realize that it can accomplish most for itself by lending its support to strengthen the other branches of the industry. It is to be hoped that this realization will continue to grow and expand in geometric progression. In its inception the National Electric Light Association was an organization for the Central Station exclusively, and without reviewing its evolution and growth to an Association of the present proportions and purposes it may be stated irrefutably that the expansion of its activities and aspirations has contributed to its usefulness and strength. Furthermore, I am firmly convinced that no part or section of the National Electric Light Association comprehends and realizes better than the Pacific Coast Section the beneficial results of such broader policies. I hope that unceasing effort will be exercised, especially by the Committee on Cooperation, to bring about an even more binding and closer affiliation between the four branches of the industry than exists at the present time.

War Service —

I cannot conclude without paying tribute to the splendid part that the men of the electric industry played in the winning of the war, and while greatest praise is due to the men who went to the front, it must not be forgotten that those who stayed at home performed a service that was more prosaic but entirely necessary. However, to the men that donned the uniform belongs all the glory and our patriotic spiritually. Therefore, in so far as we can, even to the ultimate straining point, we must provide position for such of our straining point, we must provide positions for such of our boys that return and desire to re-establish themselves with us, even though they come back in disabled condition. This may involve some temporary sacrifice on our part but the sacrifice can be no greater than that of the men who left family, home and means of livelihood to uphold the honor and dignity of our country.

REPORT OF SECRETARY

A. H. Halloran, as secretary, reported as follows:

This third annual convention of the Pacific Coast Section N. E. L. A. marks the rounding out of two years and a half of well directed effort toward improving electrical conditions in this section of the country. For, contrary to common opinion, a convention is but an incident in the life of an association; a time for taking stock of past accomplishments and arranging future endeavor. Throughout the entire year the officers and committees are continually at work along lines whose results become manifest at the annual meeting.

From its very inception, the Pacific Coast Section has been a leader along untrodden paths. Its initial plan of organization, whereby the manufacturer, the jobber and the contractor-dealer have a voice in its councils, is being adopted by other geographic sections which heretofore laid undue emphasis upon the central station membership. Through the efforts of its first Commercial Committee, a sound merchandising campaign is being actively prosecuted under the

direction of the California Electrical Cooperative Campaign Committee. Its Engineering Committee has been foremost in advocating standardization, and in formulating codes for the use of regulatory bodies, and recently the Publicity Committee has laid the groundwork for a popular educational campaign which should do much to improve public relations.

This last movement is the direct outgrowth of the Del Monte Convention, when the Public Policy Committee recommended the establishment of a Publicity Bureau. The first step to this end was the appointment of a Publicity Committee, which has done much work of a preparatory nature, but most of whose suggestions could not be carried out because of a lack of funds. It is anticipated that definite means will be taken at this meeting to bring about the creation of an informed public opinion regarding the electric utilities.

The financing of the Section during the past year was materially aided by an appropriation of \$2,000 from the National Association. By this means it has been possible to refund one-half of the \$1,500 advanced by the California companies to put the Association on its feet at the start, and also to have some money available for publicity means. Our request for a refund of one-half the percentage dues paid by Class A members, and a greater localization of effort, has been referred to a special committee which will meet at Atlantic City on May 19th of this year.

During the past year the Engineering Committee started two innovations, whose need was removed with the end of the war, and which were consequently discontinued; one being the establishment of a Salvage Bureau, and the other an interchange of expert personnel—the one a clearing house of equipment, the other a clearing house of men. If the war had continued, each might have been an effective means for facilitating the giving of good service. The Committee has gone on record as strongly in favor of standardization of equipment to care for prospective railway electrification, and has also submitted a code for overhead line construction to the California Railroad Commission. Because of Professor Ryan's absence from Stanford University, there was a suspension of insulator investigations. Since peace has come, the Engineering Committee has directed its energies to the preparation of the excellent program of papers to be presented at this convention.

The energies of the Commercial Committee members have been closely associated with the California Cooperative Electrical Campaign, which has brought about concerted appliance sales effort on the part of the jobber, dealer, and central station, incidentally promoting a better feeling between these two branches of industry and accomplishing much good by an extended appliance advertising campaign. These excellent inter-industry relations are reflected in the fact that this Coronado meeting is held during the same week and at the same place as the Jobbers and Contractor-Dealers' meetings.

The Membership Committee has made an excellent showing, having secured a total of 254 new members, and if it had not been for the abnormal conditions due to the war, this record would undoubtedly have been exceeded. Particular mention should be made of the work of J. M. Buswell, of the San Joaquin Light and Power Corporation, and of J. W. Burns, of the Southern California Edison Company, the latter securing 329 Class B members from his company, this representing considerably more than one-half the Class B members of the Association. Two suggestions which have helped to stimulate member interest during the past year have been the mid-year dinners given under the auspices of, or with the cooperation of the Section at San Francisco and Los Angeles, and the publication of the "Electrifier," which advises members of Section doings. Some effort has been made to bring about a closer affiliation with the electrical leagues

in several cities throughout the Section, and it would seem desirable that such affiliation be accomplished during the year to come.

Our membership of today is as follows:

Class A	33
Class B	534
Class C	5
Class D	20
Class E	84
Total	676

Of last year's total membership of 700, 276 do not appear on our list, due to deaths, resignations and non-payment of dues. As many have neglected to pay their dues merely through an oversight which will be

corrected before the end of the year, it is safe to say that we will again reach the 700 mark before the end of the year.

That the Association has so successfully weathered the storms of 1918 augurs well for its future prosperity. The plans for such activities as might be undertaken have been so well outlined in President Kahn's address as to require no amplification here. At this time I cannot forbear from expressing my appreciation of the kindly spirit and the cooperation accorded me by all officers and members in the Association. The officers do not make an association such as ours, but in the words of Kipling, it is "the everlasting teamwork of every blooming soul."

Report of Public Policy Committee

JOHN A. BRITTON, Chairman

(The courage to resume business with confidence in the face of uncertainties is the message of this report to the industry. The carrying on of the inter-connection and inter-cooperation of power companies into peace conditions, more comprehensive plans for the education of the public as to the position of the public utility and the reemployment of returned soldiers are among the recommendations made.—The Public Policy Committee consists of John A. Britton, chairman, W. A. Brackenridge, A. G. Wishon, R. H. Ballard and Mortimer Fleishacker.—The Editor.)

If there ever was in the history of our industry a reason and an excuse for the presentation of the report of the Public Policy Committee, the events of the year 1918 present such reason and excuse, on account of the abnormal conditions which existed throughout the United States due to its conflict with the Central Powers and the necessity for the exercise of every effort human ingenuity could devise to bring the war to a speedy close.

Electrical Industry Helpful.—In this helpfulness of patriotism none more signally distinguished itself than did the electrical industry, for it may safely be said that without its help and the cooperation of every generating and distributing company in the United States the marvelous wonders accomplished by all the arms of the Government and in its Army and Navy service would never have been realized. That this was the united policy of the public utilities speaks volumes for their patriotism as during the greater period of the war, the utilities suffered severely from war conditions, while practically every other industry in the country benefited.

On the Pacific Coast, where new impetus was given to shipbuilding, manufacture of aeroplane motors, and in the intensity of agricultural production, the elements of electricity entering into the success of these war measures astounded the balance of the United States. Many dormant industries were awakened to new life. California found itself, by the researches of the Government and its agencies, possessed of minerals entering into the manufacture of munitions that had heretofore lain dormant, and not only to the nation, but to the Pacific Coast states was added a wealth, not alone of money, but of knowledge, that nothing but the crucial test of war could have so thoroughly developed.

Interconnection of Systems.—At the outset of this report your Committee desires to extend its commendations to the Railroad Commission of the State of California, and to the several public utilities of the state, for the particularly active, energetic and resourceful endeavors which they made to bring about the most economical utilization of the generat-

ing plants of all of the public utilities of this state, not only hydro-electric but steam as well, and to the credit of these companies be it said that they acted under direction of the Railroad Commission as a unit.

In the progress of the investigation of the question of interconnection of the several companies in the state by the Commission and Government officials—Major Geo. F. Sever of the War Industries Board, and Mr. D. M. Folsom of the Fuel Administration—it was developed that the need of additional hydroelectric energy was painfully apparent. While this had been known to the operating companies of the state, and while every endeavor humanly possible had been made to have Congress pass such legislation as would relieve the shortage, nothing had been accomplished, the last Congress adjourning while just on the eve of passing a bill that, while not fitting and meeting all conditions, was nevertheless

RAILWAY ELECTRIFICATION

Whereas, Public interest demands the conservation of crude petroleum for the derivation of distillates and lubricants and for use as a fuel only where other forms of power are not available, as in merchant and marine shipping, and more especially for the driving of our ships of war, and

Whereas, The greatest use of petroleum, from the California oil fields, for power generating purposes, is in railroad locomotives, this use amounting during 1918 to thirty (30) million barrels of the total production of over one hundred (100) million barrels, and

Whereas, The greatest conservation of petroleum, from the California fields, can be accomplished by the substitution of hydroelectric power for a portion of the steam power now produced by means of petroleum fuel, and

Whereas, Such substitution of hydroelectric, for steam power, will require a construction period of several years for the development of the substitute power, and

Whereas, the plans for the corporations now developing hydroelectric power, in and near the State of California, for future extensions of their existing developments, will be generally changed by the possibility of their being called upon to supply such a demand as that of the electrification of mountain railroad divisions;

Now Therefore Be It Resolved, That the Pacific Coast Section of the National Electric Light Association, assembled in convention at San Diego, California, this 2nd day of May, 1919, instructs its Engineering Committee to make a study of the subject of conservation of fuel oil by means of the electrical operation of railroad divisions, with the end that it may consult with and advise the technical committee of the National Association entitled the Steam Railroad Electrification Committee, concerning the peculiar needs and problems of this section; and

Be It Resolved, That the Engineering Committee of this Section be further instructed to cooperate with the committee appointed by the San Francisco Section of the American Institute of Electrical Engineers for the purpose of investigating this subject, provided such cooperation is agreeable to said Institute Section; and

Be It Further Resolved, That the Engineering Committee of this Section be also instructed to report to the Executive Committee such further action in this matter as it may be pleased to recommend.

of a nature that would have to some degree encouraged further development. The shortage of hydro-electric power was accentuated by the abnormally low rainfall in the years 1916-1917 and 1917-1918, which seriously curtailed the output of the hydro-electric plants, and the situation was rendered still more serious because at the time when the Government desired to conserve as much as possible the uses of fuel oil for war purposes, additional and increased amounts of fuel oil were essential for use in steam plants for the generation of power.

It has been estimated that the net results of interconnection existing and planned will conserve power amounting to over 100,000,000 kw-hr. per annum.

The diversity in the northern group was not so great as the southern group. In the northern part of the state each of the companies operated at 60 cycles and there was no particular difficulty experienced in operating the entire network as a unit. This was not true of the situation in Southern California.

The emergency of the war brought about a tie-in with the California-Oregon Power Company, which practically put in service the longest transmission in the world. It is interesting to note in this connection that there remain but four small gaps to complete a continuous tie-in over 2,000 miles in length, stretching from Harlowtown, Montana, through the Pacific Coast states and down to the border of Mexico; thus is very nearly realized the dream of electric engineers of the Pacific Coast that at some day a bus bar from Oregon to Mexico might be constructed from which would be fed each of the systems involved, and the only limitation on such a project today is in the question of the limited economical capacity voltage at which they may be operated.

Productive Resources.—We have formerly spoken of the intensity of production in the Pacific Coast states in agriculture. The war demonstrated that what is needed is more production, and what the industrial worker wants is opportunity to take part in the great business of the world, and the more we can expand our productiveness the greater will

be his opportunity for work. The lands to be reclaimed from the flood waters of our rivers on the Coast, and the application of irrigation to semi-arid lands existing, multiply their food producing power and increase the productive possibilities of the country, and also tend to increase the demand upon our Central Stations and therefore urgently present again the question of more liberal terms by the Government in the occupancy of Government lands for the production of water power. Under the intensive electrification of lands, it is easily demonstrable that the Pacific Coast states alone, if they possessed the intensive cultivation of foreign countries, particularly of southern Italy, could produce foodstuffs sufficient to feed the entire United States.

Unrest in Industry.—Confronting the country at this time is a vague feeling of industrial unrest, very largely augmented by fear. Is not one of the first steps necessary to improve this situation for us all to pick up our courage and resume active work of expansion? Should our development work be held back because the cost of money, materials and labor is more now than under pre-war conditions? These are matters which upon the scientific basis of regulation in effect in California, should be, and we believe are, given consideration in the fixing of rates of public utilities by our State Railroad Commission. The principle of regulation is not to retard industry, but rather to encourage it. We need also the recognition of the fact that the dollar today has less purchasing power than it ever had—good policy dictates that to keep the utility in a healthy condition, it must have credit and that credit can only be maintained by its power to earn a return which will enable it at all times to meet its every obligation, provide a surplus for proper return to its stockholders, provide depreciation reserves and by so doing stimulate it to renewed efforts of economical administration.

Participation.—Has not the time come when the workers in our industries must have opportunity to participate in the increment of their own labor? Participation is said to be the antidote to anarchy. As a step in this direction, the granting of opportunity to employees to become stockholders has been found to be effective. Stock purchase plans usually permit the employee to subscribe for a substantial block of stock, as compared to his monthly wage, providing for payment on the basis of small monthly amounts saved from his wages and allowing an actual participation by crediting to his account dividends on the full amount of his subscription, at the same time charging his account with interest at a lower rate on deferred payments. The industrious worker of today does not hold to the old socialistic desire for a division of wealth. He knows pretty well that if all the wealth of the country were divided equally, the resultant amount to each individual would be only about \$2,500 of invested capital, the interest upon which would be but a negligible annual amount. The principle of partnership and participation properly administered makes for loyalty, because down through the ranks to the last recruit,

BUREAU OF STANDARDS

Whereas, There is existent in the State of California and other commonwealths of the West, comprising the membership of the Pacific Coast Section, N. E. L. A., legally constituted bodies whose function it is to supervise the establishment of rates and the general efficiency with public service corporations serving the public, and

Whereas, Conditions west of the Rocky Mountains present new and unusual features in the development of our natural resources peculiar alone to this great section of our nation; and

Whereas, The aforesaid legally constituted regulating commissions enjoy the complete confidence of the utility companies and the public served in the performance of their duties;

Therefore Be It Resolved, That we, the members of Pacific Coast Section, N. E. L. A., in convention assembled at Coronado, do hereby express our disapproval of the proposed establishment of a standard of ethics by the Bureau of Standards at Washington purporting to outline methods of operation, the fixing of rates or any other matters that are today rightfully enjoyed by the aforesaid regulating commissions in the commonwealths of the West.

Furthermore Be It Resolved, That member companies of the Pacific Coast Section, N. E. L. A., be requested to write to each of their congressmen, sending them a copy of this resolution and requesting their influence in opposing any congressional appropriation for the activities proposed by the Bureau of Standards. And also that the National Electric Light Association be requested to adopt a similar resolution."

hope becomes the inspiration, fear does not exist to impair efficiency, the square deal is recognized as every man's due, and interwoven with every day's work is the purpose ahead. The worker knows that his superiors are his friends, his co-laborers are his partners and that within the organization is his present and his future.

Reward for Efficiency.—The public utility company, as well as its employes, should have opportunity to participate, if best results are to be obtained. The utility which through initiative research or design, or through wise, skillful and diligent management, has reached a point of such efficiency that it is enabled to improve its service to its consumers, to operate at a lower cost, and to more advantageously finance its requirements, should not be crowded into a position where it will be stripped of all the benefits of its performance, but rather should receive a recognition which would tend to put a premium on careful, economical and efficient operation. This would not only encourage capital but would hearten the employe by a recognition of his efforts. The regulating bodies must eventually recognize that the utility which is most successful is the one which can best serve the public.

Rates for Service.—Responding to applications of the public utility companies and to the suggestions of the President of the United States, the Secretary of the Treasury, and the Comptroller of the Currency and other government officials, that as a necessary aid to winning the war, public utilities must be kept in sound financial condition, the Railroad Commission of the State of California, has, during the past year, made numerous adjustments in rates for service, in the majority of cases by the addition of surcharges. This form of added rate was adopted to compensate for specified increased costs, in order that adjustments might be made from time to time if costs were reduced or increased, and in order that the whole amount of the increase might be readily eliminated when the cost of operation returned to the normal pre-war basis. The effect of the addition of the surcharges has been to permit some of our member companies to obtain additional funds by the sale of securities with which to proceed with necessary developments which have been delayed due to shortage of men and money as well as the cost of materials.

Future Conditions.—Since the help given by the Railroad Commission to the public utilities, conditions of operation have suffered little or no change; wages remain at war time prices, taxes have increased, and material and supplies of the character used by public utilities have not changed materially. The hope is ventured that the Commission may in readjustment of rates that will occur eliminate to a large extent the surcharge, which bears the impress of a war time measure and therefore, now that the war has ceased, ought to be eliminated, and make such adjustments of schedules of rates as will compensate the public utilities to the same degree and help to maintain their increased efficiency. After all, it may be broadly stated that the success of the

public utilities means the success of the state in which they operate. The relation of capital and labor is so strong that one cannot be divorced from the other, and as the public utilities must recognize the reasonable demands of labor and must meet daily operating conditions by submitting to the laws of supply and demand on the question of materials, encouragement therefore in rate of return must be given so that they can be financed in the construction of the inevitable increases in its plants. It is only fair to say that most of the Railroad Commissions have been awake to the necessity for this action and have demonstrated it in the decisions rendered often against ignorant public opinion.

Education.—To accomplish a feeling of security among investors, not only must there be the Commission action but also the education of the masses, and the education particularly of organizations that are formed for the purpose of contesting at all times, in and out of season, the reasonable applications of the public utilities for consideration of their conditions. The public utilities are not sufficiently alive to the necessity for this education. They spend money freely in the extension of their lines and in the securing of new business, but they do not get to the vitals of their interests when they neglect by the means within their power the proper education of the people, and while there has been a change for the better in respect to this in the past few years, the field is still comparatively untouched. Advertising to a degree accomplishes it, but better still would be the personal contact by heads of public utilities with the public in explanation of their difficulties and problems; also the education of the employes of the utilities in such a way that they would be able to discuss with the consumers properly the trials and difficulties, as well as the aims and ambitions of the utilities. There should be in the public schools and universities of this state an education more extensive than at present given in relation to the public utilities and in the matter of motor-driven machinery, so that the consumers themselves would understand the general operation of systems and thus become more fully acquainted with what their demand upon the company means when reduced to a question of dollars and cents by the monthly bill.

In connection with this education of the masses

EXTENSION OF THE SPIRIT OF COOPERATION TO PACIFIC NEIGHBORS

Whereas, The Pacific Coast Section, N. E. L. A., is an organization that has fathered the industrial development of this section of our nation which has today reached a plane of activity nowhere else in the world even approached in electrical development per capita of population, and

Whereas, We recognize that this has largely been brought about through a spirit of cooperation of all those engaged in this work on the basis that "He profits most who serves best," and

Whereas, We recognize that the recent world conflict was largely due to the grasping characteristics of the Central Powers in defiance of this great fundamental law of ethics,

Therefore Be It Resolved, That it be the sense of this meeting that this selfsame spirit of cooperative helpfulness should be broadened and extended as rapidly as possible so that our increasing commercial and engineering relations with countries bordering the Pacific ocean may be built upon substantial foundations, free from the spirit of domination or grasp and more properly built upon the basis of sensing the need for service and that the supplying of that service at a profit is legitimate and ethical provided all parties in the exchange are benefited thereby.

encouragement should be given the educational service of both the National Electric Light Association and the University of California Extension, as recommended by the California Electrical Cooperative Campaign.

Aside from the question of participation in the public utility by the employes thereof, there should be engendered very largely among the employes the feeling that the corporation is alive to the personal interests of the employes, in addition to their investment in its properties and participation in its profits. If this interest is displayed, by such consideration as one human being will give to another, it will help to break down a lot of the prejudices that exist, because an employe dissatisfied is spreading an unrest more effective against corporations than the utterances of those who preach the general proposition that "All corporations are soulless."

Re-employment.—Your Committee recommends, as a matter of policy to be adopted by all of the members of the Association, the re-employment of all employes who are inducted into the service of the United States, either by draft or by voluntary enlistment. In recognition of what these men have done in the service of their country, their old positions should as far as possible be given to them. If such positions have been abolished, they should at least be offered a position of equal importance. It is reasonable to suppose that the temperament of the men, by reason of their service, has been somewhat changed, and due allowance for this should be made, and while the Committee recognizes the necessity for the economical administration of every organization, the ambitions of men held responsible for economies should not be permitted to interfere with the proper restoration of the men.

The Future Considered.—The possibilities electrically on the Pacific Coast are boundless, not only in the productivity of electricity but in its extended use. There is no part of the world where its use is more general or more diversified. It is not an unusual thing to find in the homes of the farmers all of the conveniences that go with electrical development, from the electric range in the kitchen to the motor that supplies the water for irrigation of the farm. The average rate per kilowatt hour at which energy is sold upon the Pacific Coast is less than that of any other section of the United States. This is partly due to hydroelectric developments and also

to the greater diversity of use, and as soon as there is a relaxation by the Government of its drastic rules governing possession of public lands, so soon will arrive a lower rate for the benefit of the communities which we serve.

The help of the regulatory bodies in all the public land states is needed to impress Congress at its next session with the necessity for immediate action in unlocking the doors so long closed to water power development. Conservation of oil, while advisable, is not the only reason for action. Construction of hydroelectric plants, in nearly all of the streams, means reservoir capacities and the triple purpose will be served of flood control, power and added water for irrigation.

The future of our industry on the Pacific Coast was never brighter. With the intensified education predominant here in the utilization of our commodity, and with a certainty of a proper return upon capital being given and with the lessons learned at this Convention respecting contact with the public and the consumer as well, it is certain that the demand for electricity will continue and increase. Not the least of this demand will arise from the installation of house appliances, particularly the electric range, which is now reaching a price and an efficiency that, with the low rate offered by the Pacific Coast companies, should make it a very strong competitor of the gas range and its use should be further exploited.

In the reconstruction of the nation following the war, labor must be fully considered, and with the suggestions heretofore made and cooperation with labor there should be no difficulty in the adjustment of all of our problems.

Legislation.—As contained in previous reports, your Committee strongly recommends to the companies a more careful consideration of its relation towards legislation. It does not mean by this that corporations should again enter politics, but it does mean that the corporations with millions of invested capital in this state should see to it that in a fair and just way they should be protected by such educational knowledge of the masses that the representatives in legislative bodies will have due cognizance of their rights, and therefore increase rather than diminish the tendency toward legislation that will be helpful. In the next two years steps should be taken by the companies to secure this position.

Municipal Ownership.—Municipal ownership is still rampant, under misguided and misinformed conditions. Much of the spirit that engenders municipal ownership can be arrested, in the judgment of your Committee, by a policy of publicity that should be the same throughout the territory of the organization. Municipal ownership arises primarily from some misguided policy instituted by some public utility, in which an error of judgment on the part of the utility provokes the righteous indignation of right thinking men, and the only relief apparent is in the service to itself by the municipality; and once this seed is planted there are plenty of people who, without due knowledge of what they are discussing,

CALIFORNIA ELECTRICAL COOPERATIVE CAMPAIGN

Whereas We are fully convinced that the best interests of society are served when equal opportunity is accorded to all men in the development of our natural resources and in the merchandising of electrical appliances, supplies and apparatus connected with this development, and

Whereas, There is today existent in California a movement known as the California Electrical Cooperative Campaign, which is preaching broadcast throughout the confines of our state the gospel of cooperation in which it is recognized as a fundamental axiom that "He profits most who serves best," and

Whereas, Through the Advisory Committee and the Field Representatives of this organization effective results are already being obtained in the bettering of our industry,

Therefore Be It Resolved, That we, the members of the Pacific Coast Section, N. E. L. A., in convention assembled at Coronado, do hereby heartily endorse this movement and pledge to it our unqualified support, and it is hereby recommended that our central station membership continue their support during the coming convention year on the same generous basis of past assessments.

become rabid advocates, and the people with no knowledge of the situation are generally led by such forces.

The underlying motives creating municipal ownership are two-fold—first, dissatisfaction with the utilities' action, whether applied to the municipality or the public; and second, the misleading statements of low costs of operation and large profits, which are contrasted with prices charged in other sections by privately owned utilities. Both of these fallacious arguments may be successfully met, if the public utilities will move with one accord on the first

motive, and to destroy the second motive secure legislation which will provide at least for some responsibility which will cause the municipally operated utility to keep its account by the same methods that privately owned utilities are required to keep them. On the same basis of determined costs no privately owned utility need fear comparison with the publicly owned.

The Committee in conclusion congratulates the Convention upon the work it has accomplished during the past year and wishes the continuance of that success for the year to come.

Commercial Problems of the West

(With the gradual cessation of abnormal demands on central station output, interest in the electrical range revives—and is to assume considerable importance in the coming year, according to discussion developed at the Coronado conventions. The training of sales personnel, possibilities before the contractor and dealer, relations with the architect and the selling of the idea back of the goods were among the subjects which received especial attention.—The Editor.

REPORT OF THE COMMERCIAL COMMITTEE

Meeting War Conditions

From the standpoint of the Commercial Departments of our member companies, the past year has been unusual in many respects.

Large demands for power and the necessity for conservation of electrical energy, resulted in many companies finding it unnecessary to solicit business. Rates to consumers were low as compared to costs of other power and, with the increasing price of oil, many private plants were voluntarily shut down and central station service substituted.

Capital for new business development was meager, owing to the restrictions of Federal Commissions, the reluctance to raise funds for public utilities in the face of our Government's needs, the low market value of securities, and the high price of money and material entering into all kinds of construction.

To offset the abnormally high operating costs, relief was granted through emergency surcharges, to those central stations showing the governing bodies that uncontrollable expenses had increased to such an extent that assistance was required. This was necessary in order that the properties might be satisfactorily operated and the public properly served.

The work of the California Electrical Cooperative Campaign during the year deserves careful and thoughtful attention. Under the supervision of the Advisory Committee, a condition is rapidly being brought about which gives better electrical service to the public, and incidentally more profit to the individuals and companies in the electrical industry. The results obtained through the Campaign will be considered as satisfactory, and indicate conditions of a still more satisfactory character during the present year. Chairman L. H. Newbert's Annual Report of the Campaign work has been printed in pamphlet form and is now being distributed.

Commercial Papers

I have great pleasure in directing the attention of the Convention to the high character of the

papers to be presented at the sessions of the Commercial Section. These papers have been carefully prepared by men well qualified to discuss the live topics which are to be considered here. The keynote of the papers is Cooperation; Cooperation that really cooperates; Cooperation that will develop better public utilities, better business concerns, better employees, better sales methods, better service and better relations with the public. Much has already been accomplished, yet much remains to be done.

(Here followed an enumeration of the papers which must be omitted, owing to lack of space.)

The war has been won! We are now passing through the readjustment, or settling down period. It is expected that this period can be measured by months, and after then, with great industrial activity, increased population, large developments in hydroelectric plants, money available for extensions and new business promotion, broad gauge cooperation between ourselves and with the public, we should soon begin to witness the beginning of an unprecedented development of the resources of the Pacific Coast.

REPORT OF COMMERCIAL COMMITTEE SESSION

Thursday Morning, April 30, 1919

Session was opened by A. W. Childs, the chairman, with about 100 delegates present.

THE PROPER TRAINING OF THE SALES PERSONNEL

In presenting the first paper for discussion, "The Proper Training of the Sales Personnel," L. H. Newbert, Pacific Gas & Electric Company, San Francisco, outlined briefly the necessity of a carefully selected and highly trained organization in electric utility companies, pointing out that the utility company of today is almost as much a purchaser as a seller—as much a buyer of good will to be paid for in services as it

A BUREAU OF PUBLIC RELATIONS

Whereas, The electric utilities are engaged in efforts whose success is largely dependent upon an informed and a favorable public opinion.

Be It Resolved, That a bureau of public relations be established under the direction of the Public Policy Committee to collect and disseminate information calculated to create and maintain a friendly public attitude toward the electric utilities.

is a seller of kilowatt hours. To be successful it must be on harmonious terms with the population it serves and in this line of its operations the salesman, as the point of contact, is not only important—he is absolutely essential.

In the selection of salesmen, Mr. Newbert urged that they be taken from the ranks of the company in order to be assured of two very essential characteristics—faithful service and loyalty. Unquestionably integrity and honesty are, however, he stated, the first requirements, because of the company's reputation with the public depending very largely on that of its salesmen who quite frequently, in the eyes of the public, are the company.

In training the salesman, it is essential that he be thoroughly schooled in the policies of the company and the workings of its every department. In addition to the closest possible contact and cooperation with his own organization, he must familiarize himself with every detail connected with the appliance or service which he is delegated to sell. With the present day tendency in rate fixing toward scientific rates, it devolves upon the salesman to understand the principles of rate making and be capable of picking out the most economical rate for his customer's conditions, working it out to the latter's complete satisfaction and understanding, if possible. Much information can be gained from trade journals and the salesman should be encouraged to read them regularly.

Mr. Newbert also touched upon various ways in which the salesman may be of value to the company outside of his regular duties, such as interesting himself in the various activities making up the life of the community as well as adjusting complaints and disputes between consignees and any department of the company or any trouble connected with the company's services.

In the discussion on Mr. Newbert's paper R. H. Ballard, Southern California Edison Company, Los Angeles, emphasized the point that the salesman is the first point of contact between the company and the consumer and that the impression left by him will have great weight; that part of the service on the part of the salesman would require that he see to it that the consumer is well taken care of from the minute the contract is signed and the friend he has made in the consumer be accorded every courtesy from every department of the company. "A salesman who knows his business," stated Mr. Ballard, "cannot help being enthusiastic for the company and for the service as a whole. He it is who paves the way for the partnership between the company and the consumer."

John A. Britton, Pacific Gas & Electric Company, San Francisco, following Mr. Ballard, humorously announced that a salesman possessing all the characteristics mentioned by Mr. Newbert would not be a salesman but an executive officer. "The primary qualification," stated Mr. Britton, "for a salesman is his ability to approach people and present the argument." Mr. Britton urged closer contact between the salesman and the executives of the company. "Every salesman," he said, "should be known by the boss and should himself know the policies of the company, getting them from the boss. It makes no difference whether he is selling ranges, appliances or anything else, he should know the policies of the company." Mr. Britton strongly urged the education of salesmen in the company's business. He advocated the visiting of power plants, substations, warehouses, offices and garages for the purpose of thoroughly understanding the business. In passing on the highly specialized phase of the electric utility salesman, he stated, "A man who can sell drugs or dry goods cannot sell electricity without an education in the electrical line, as it is a peculiarly specialized line." "The West," he said, "is particularly fortunate in having wide-awake salesmen."

Taking up the discussion from the manufacturers' side of the question, K. E. Van Kuran, Westinghouse Electric &

Manufacturing Company, Los Angeles, took exception to the premise of the authors that the sales department is the all-important branch of any industry. "Experience teaches us," he said, "that the all-important, dominating feature of any business, and particularly the electrical business of today, is Service. Service can only be rendered through the proper coordinated effort of every person, section, division and department. In considering the training of the sales personnel, let us apply the principal features of this training to every department of the company and to every branch of the industry, with some additional features added for the specialized branches of our work."

"In the selection of salesmen, the first consideration should be the applicant's understanding of human nature. If we assure ourselves, first, by means of a proper analysis, that the prospective salesman has mastered the basic principles underlying this understanding of human nature, we need have no concern as to the matter of unquestionable integrity and honesty for this will follow through proper direction."

In closing his discussion, Mr. Van Kuran emphasized the need of what he termed "headers and interpreters" rather than "Loyalty and the Big Boss" as quoted in the paper. "You can't train an employer to be loyal," he said, "and you can't purchase his loyalty by a salary. A company will receive the loyal support of its employees in just such proportion as the company in turn gives loyalty. The day of the former type of Big Boss has passed."

Following Mr. Van Kuran, E. B. Criddle, Southern Sierras Power Company, Riverside, strongly advocated the selection of young men, molding their minds and training them in the policies of the company and thoroughly schooling them in the company's business. Mr. Criddle declared the complexity of the business required an intensive system of training, stating that "one ill-considered act of an employee improperly trained will undo all the good work and work immeasurable harm to the company."

Glenn D. Smith, Ontario Power Company, Ontario, laid particular emphasis on the need of salesmen familiarizing themselves with the policies of the company as promulgated by the management. "Let the people feel," he said, "that the company is working for their welfare and in things in which they are interested."

In closing the discussion, Mr. Newbert referred to Mr. Van Kuran's criticism of the opening paragraphs of the paper and explained that this should be considered in connection with subsequent subjects of the paper.

HOW CAN THE ELECTRICAL INDUSTRY ASSIST THE ARCHITECT?

In presenting his paper for discussion J. O. Case, General Electric Company, Los Angeles, stated that he had attempted to show the mutual advantages and benefits to be derived from close cooperation between the four branches of the industry—central station, manufacturer, contractor and dealer—on the one hand and the consumer on the other.

Henry D. Bostwick, Pacific Gas & Electric Company, San Francisco, opened the discussion with a hearty endorsement of the recommendations made by Mr. Case that a committee, consisting of the Advisory Committee of the California Electrical Cooperative Campaign be instructed to work out a definite plan of action to be approved by the Executive Committee of the Pacific Coast Section, N. E. L. A., the California Association of Electrical Contractors and Dealers and the California Electrical Supply Jobbers' Association, the matter to be then taken up with the several local chapters of the Architects' Institute for their endorsement. To this end Mr. Bostwick offered the following resolution, which was heartily endorsed and seconded by Tracy Bibbins of San Francisco and unanimously adopted:

"Resolved, That it is the sense of this Commercial Section of the Pacific Section of the National Electric Light Association that the Advisory Committee of the California Electrical Cooperative Campaign Committee be requested to appoint a sub-committee known as the Architects Committee, and that the duties of this committee be to do everything reasonably possible under the general guidance of the Advisory Committee, to bring about closer relations between the architects and all branches of the electrical industry;

"Resolved, further, That the committee take tangible form by drawing up actual rules, plans and specifications for closer contact between the architects and the electrical industry."

Mr. Bostwick also advocated propaganda for constructive advertising by central stations.

Following Mr. Bostwick, Capt. R. W. A. Brewer, of San Francisco, called attention to the fact that the architect is not an engineer but that he does encroach on the latter's field from time to time. He cited the English custom in the preparation of specifications and submission of bids as an improvement over the American practice. "In England," he said, "when the electrical contractor is submitting a bid, he knows pretty closely what he is expected to bid on. The quantities and articles are stated clearly so that all the contractors will bid on the same material. The architect's work, however, should be limited to a stereotyped form of specifications to be prepared by the contractors." He strongly urged close cooperation between the contractors, architects and engineers.

From the manufacturer's standpoint, Frederick D. Mills, National X-Ray Reflector Company, San Francisco, spoke of the great strides made by the manufacturers in the past decade in the way of getting electrical devices introduced into buildings. "The architect must look to the manufacturer," he said, "for the cooperation necessary to standardize the use of electrical devices. Further educational work must be along the lines of showing the owner and architect that contracts should not be awarded solely on price but upon the responsibility of the contractor to perform his duty in living up to the specifications." While the manufacturer's obligation ceases with the production of his materials, he is dependent upon the contractor to properly install the apparatus. A faulty installation usually reacts directly on the manufacturer.

R. E. Eltringham of the California State Accident Commission stated that the Commission has been studying the question of a code for the past two years which will shortly be ready for submission. It is the present plan to combine this code with the Fire Underwriters' Code, making it fully representative of every industry affected. Mr. Eltringham urged the electrical industry to keep in close touch with the Commission in the framing of this code.

G. E. Arbogast, of the F. E. Newberry Electrical Company, Los Angeles, stated that before the war the cost to the contractor-dealers in California of helping the architect through advertising amounted to \$4,000 to \$5,000 annually. With a revival of business, he estimates an annual expenditure for new building of \$50,000,000, about 5% of which will be expended for electrical work. He believes this percentage could be doubled by proper cooperation with the architects and recommended the employment of two men whose duty it would be to keep in close touch with every architect in the state.

SELLING THE IDEA

T. E. Bibbins, Pacific States Electric Company, San Francisco, endorsed Mr. Harper's idea as presented in his paper. To use Mr. Bibbins' words, "when it is considered in its broadest application, it means an adoption of the broad principle 'To Serve.' The public needs light and therefore

the contractor, dealer, jobber, central station manager, engineer and manufacturer's responsibility is to give it light, and he is most successful whose imagination leads him to the most scientific and successful methods. Then the industries need power, and finally, and largest in possibilities, the home must be made more comfortable and the housewife's burdens lessened, all of which we accomplish best when we 'Sell the Idea.'"

R. M. Alvord, General Electric Company, San Francisco, stated that no real sales are made today unless they benefit the purchaser and give lasting satisfaction. The real salesman, therefore, looks for people who will really be benefited by his products. "Let the salesman become imbued with the idea that the consumer will benefit and he will be enthusiastic over his work," he said. Mr. Alvord strongly advocated the use of electric appliances by each salesman in his own home.

In closing the discussion, Mr. Harper called attention to the fact that a salesman seldom has to sell a person something he needs, but that while a person's needs are few, his wants are many and it is his wants which open the field to the salesman.

Stacy Hamilton, of the Portland Railway, Power & Light Company, Portland, Oregon, was a visitor at the sessions. Responding to a call from the chairman for a few remarks, Mr. Hamilton incidentally mentioned California as being a leading state in the sale of appliances.

PROGRESS OF ELECTRIC COOKING AND HEATING

In the absence of Mr. Maddox, who was obliged to cancel his trip at the last minute, M. A. B. Nolliker, of the Southern California Edison Company, San Bernardino, presented the paper.

Glenn D. Smith, Ontario Power Company, Ontario, opened the discussion, giving the experience of his company in building up the cooking load, with a gratifying result, statistics on which will be given in a later issue of the Journal of Electricity.

In the absence of John J. Gibson, Pittsburgh, Pa., K. E. Van Kuran, Westinghouse Electric and Manufacturing Company, Los Angeles, presented the former's discussion dealing with the question from the manufacturer's standpoint:

In general, the electric range and water heater have about the same standing with central stations as did the Mazda lamp in its earlier career. The educational work being done by central stations, jobbers, dealers and manufacturers to introduce the use of electric cleaners, washing machines, ironing machines, dish washers and other electrical home devices is also having a very strong influence towards the public demanding the electric range. It therefore seems necessary for the central station to consider seriously the arrangement of its affairs to take on electric ranges.

The point brought out by Mr. Maddox in regard to multiplicity of types and styles is a very important one indeed. The ultimate user must of course bear a large portion of the development expense but the industry as a whole can be very much benefited by keeping the number of styles and types down to the minimum, and I believe the work done by the Conservation Division of the War Industry Board brought this fact very forcibly to the attention of all.

The point brought out in Mr. Maddox' paper in regard to the proper rate for electric range and water heating should receive very serious consideration. It is of course essential that a comparatively low rate be established but the cost does not have to be nearly as low as wood, coal, or even gas. For the ultimate good of the entire industry, it is necessary that the sale of current for electric cooking and heating must be profitable.

The water heating situation seems to be in about the same relative position as the range was about five years ago,

and electric water heating deserves very earnest consideration by all parties interested. Undoubtedly water heating can be done very profitably to all parties, especially where an electric range has already been installed.

P. H. Booth, Electric Appliance Company, Ontario, followed Mr. Gibson's discussion, going into the subject in considerable detail. He said in part:

Mr. Maddox refers to the progress which has been made between November, 1913, and 1917—four years which might ordinarily be called a short period, but in electric range development this short period is full of wonderful progress. During that time the proper alloy to be used as resistance material for a radiant or disc type of burner, was perfected and made commercially usable, and in this fact alone more than in anything else, is it possible for us to put our finger on one of the causes for the present satisfaction prevalent among the users of electric ranges.

In order for a business to grow and increase continually, the goods must be made right, or as nearly right as it is possible to make them up to the time of their production. And during the four years above mentioned, the actual construction of the oven linings, fuse blocks, lead wires and other details of construction were considerably improved.

Referring to the fact above stated that there is a considerable portion of the people who are devotees of the electric range, this fact was most prominently called to your attention during the year 1918 when central stations in practically every community in the country were overloaded and it was impossible for them to take on any electric range load. As the result, no sales effort was put forth and the answer was that the inquirers and insistent consumers who would not be denied the use of electric ranges, impressed every one with the fact that the electric range had a real clientele of prospective purchasers who would not use anything else.

This is also brought very forcibly to our attention by the fact that one of the largest department stores in San Francisco, and also one in Los Angeles, has an electric range on demonstration continually as a part of the model kitchen installations. This is but a further evidence that the electrically equipped kitchen, as well as the electric range, has a decided following among the buying public, as there is no branch of home furnishing suppliers which is more in sympathy with the desires of the public than the department stores. They are ever alert to detect the first indications of what the public wants. And the fact that these department stores have chosen an electric range for their model kitchen installations is a challenge to the strictly electrical branch of the industry, that they must be on the alert if they are to be recognized by the public desiring to purchase electric ranges.

This indicates that if we are to satisfy the consumer on articles for the home, whether they be refrigerators, electric heaters, gas ranges or electric ranges, these articles must be considered from the viewpoint of their appeal to the purchaser and the assortment of designs from which the purchaser may take his choice. The consumer or buyer (usually a woman) desires variety of choice in order that her fancy or discerning judgment may be appealed to and she may be made to feel that she is deciding what she wants and is not being forced to buy what some man fancies a woman needs in her home and her housework. There is another branch of the electric cooking load to which Mr. Maddox has not referred but which is coming forward into prominence with leaps and bounds, and that is the hotel, restaurant and bake-shop equipment. I hope that one of our succeeding conventions will provide for more time to be given to the importance of this hotel, restaurant and bake-shop electric equipment.

There is no piece of electrically heated apparatus that is used in the home which has caused so much grief to the

manufacturer, jobber and central station as the water heater proposition. General types of heaters now on the market can be assumed to be practical and durable and it but remains for the central station to study the water heating business carefully and decide upon a rate or rates applicable to the different types of heaters, if necessary, so that the competition may be met and the electric kitchen completely equipped may be a reality.

E. H. Richardson took the point of view that the progress to be made is largely a question of what we can give the consumers for their money; i. e., in quality and service at limited cost. Mr. Richardson took issue with Mr. Booth on the question of number of models and agreed with Mr. Maddox that "the fewer models we can get along with, the lower the cost will be, both to the manufacturers and the dealers. The number of models which are finally agreed upon by the industry will become a very important factor in purchasing and handling ranges."

To a considerable extent, the troubles experienced with electric appliances, Mr. Richardson believed, depend upon the judgment and general discretion of the user. Hence the need for a certain amount of systematic work in an educational way with the consumer.

Mr. Richardson did not anticipate a great deal of further development in the water heater. This problem is, he thinks, a rate question and as such is primarily up to the central station.

Mr. Libby, of the Simplex Electric Heating Company, related the experience of the Boston Edison Company with a flying squadron of 17 women in a range campaign and of heavy duty ranges installed for the government in the past two years.

M. A. DeLew and L. H. Newbert also discussed the paper.

THE CONTRACTOR-DEALER OF TOMORROW

Discussion of Mr. Rendler's paper was opened by A. H. Halloran in the absence of Arthur Kempston, San Francisco. Mr. Kempston's paper recommended the discontinuance of the term socket appliance and definite provision for educating the public in the need of special outlets.

D. E. Harris, Pacific States Electric Company, San Francisco, spoke of the work of the California Cooperative Campaign Committee and of the possibilities offered by the Pacific Coast Section, N. E. L. A., for closer cooperation between contractor-dealers and central station men. According to Mr. Harris, the contractors must continue to develop store and advertising methods and must arrange advertising to tie in with the advertising of the manufacturers.

M. A. DeLew frankly stated that it is right "up to the contractors and dealers themselves to keep abreast of the times and do things."

Carl Heilbron, dealer, of San Diego, waived aside all distinction between branches of the industry, maintaining "there are not four branches but merely one big problem. The objective is the ultimate consumer (The Man on the Street). The problem must be looked at in the big, broad way with no disagreement or dissension." Mr. Heilbron urged that the destinies and demands of the public be studied and analyzed. "Service," he announced, "is divided into two parts: First, pre-sale service, which comes before the sale is made. To this phase, almost exclusively, all thought and attention has been given for years. Second, post-sale service, which comes after the sale has been made." As an illustration of the latter, Mr. Heilbron stated that his firm uses a trade mark to show that they stand back of every article sold, and that the responsibility does not cease with the merchant after the sale has been made but continues indefinitely thereafter.

Western Problems of Engineering Interest

(A strong recommendation of railway electrification in the West and a discussion of the problem of the formulation of a safety code formed part of the report of the Engineering Committee. The discussion of engineering papers centered about problems of immediate interest which had developed through the exigencies of the war and after the war period just passed. —The Editor.)

REPORT OF THE ENGINEERING COMMITTEE

H. A. BARRE, Chairman

Effects of War

The work of the Engineering Committee for the year 1918 was so seriously affected by the disturbed conditions of the country, and the organizations of the member companies were so reduced by the draft and the influenza that the Committee decided to place its work on the basis of strictly war and economic essentials and not attempt the usual field work and investigation of special subjects of general interest.

The Sub-Committee on Insulators was continued with the idea that since the program of investigation at Stanford University laid out during the previous year could not be carried out, the operating experience of the companies should be recorded and classified.

After the date of the armistice the Insulator Committee made a further investigation of the possibilities of continuing the Stanford tests. It was decided that it was still undesirable to consider continuing the tests until the university should have resumed a more nearly normal condition.

The manufacturers and the operating companies have made available for the purposes of the tests a very considerable number of insulators, both mounted and unmounted, and it is thought that it is desirable to continue the work laid out, or some modification of it, as soon as practicable.

Interchange of Facilities

During the war the Committee attempted to extend the application of the principle of interchange of facilities to other things than power plants and transmission lines. It attempted to keep the companies advised of each others' spare and unused apparatus, such as transformers, motors and the like, in order that it might be used in places where its value would be greatest to the country and to the industry as a whole. It also attempted to render the services of experts in any line of work in one company available for the use of other companies, particularly where similar men in those companies had been called into the service of the United States. Mr. Harry Sessions was appointed a sub-committee in the matter of interchange of apparatus, and Mr. J. E. Woodbridge in the matter of exchange of personnel.

The armistice was declared shortly after these arrangements were made and rendered their continuance unnecessary. Mr. Sessions' comprehensive paper in the Journal of Electricity of February 1st very clearly shows the benefits to be derived by the following out of this idea under normal as well as abnormal conditions.

The Line Safety Code

The report of the Sub-Committee on Line Safety Code was received by the Engineering Committee and officially transmitted to the Railroad Commission. It is felt that the Pacific Coast companies have given the Railroad Commission in this Code the best of their knowledge and experience covering the requirements of Pacific Coast conditions, and particularly California conditions, and that the Engineering Committee, and also the Pacific Coast Section, stands solidly behind the recommendations of this sub-committee.

It has been found that the Bureau of Standards objects strongly to the idea that a Code differing from that prepared by itself should be given consideration. It is the opinion of the Engineering Committee that it is of more importance for the Pacific Coast companies to have a practical workable Code simplified and made applicable to conditions with which Pacific Coast engineers are familiar and entirely competent to pass upon, than to attempt to put into effect the Code prepared by the Bureau of Standards. The fact that the Bureau of Standards attempted to cover the whole of the United States makes its Code necessarily of somewhat remote application to our local necessities.

The Committee has experienced a feeling of concern over the extent of the activities of the Bureau of Standards in respect to the regulation of public utilities.

In addition to the National Electric Safety Code above referred to, the Bureau of Standards has issued a circular of Standards for Electrical Service (Circular No. 56) and has under consideration—

A National Gas Safety Code,
A Set of Standards for Gas Service,
A Modification of the National Electrical Code issued by the
Board of Fire Underwriters,
Street Lighting Service.

It is reported that it is contemplating a plan of establishing Standards of Public Utility Ethics governing the relations between the public authorities, the public, and the public utility companies on questions of rate making, valuation, capitalization, financing, franchises, and public relations generally.

The Committee seriously questions whether the results of such activities will be of benefit to the industry and to the public. It is its opinion that the standards and procedures developed by the large body of experienced men in the industry must necessarily have greater weight than the studies and compilations of a group of scientists who have had no personal connection with the industry.

It should be recognized that strict standards throughout the country may not result in the greatest economy and the best service to the community, and the fact that different groups of men work out different solutions for the same problem is not a dis-

advantage. A difference of methods frequently leads to new developments which the strict following of a standardized method would preclude. In the opinion of the Committee, one of the reasons why the United States went to war was to avoid the plastering of "verboten" on the walls of buildings of American industries, and that the Bureau of Standards is showing evidence of a tendency toward the establishment of an entirely unnecessary bureaucratic control in all public utility matters.

What we really need is assistance to get the things done that need to be done, instead of so many reasons why things cannot be done.

Railroad Electrification

The Committee has given some consideration to the matter of railroad electrification.

Under date of January 18th the Engineering Committee submitted to the Executive Committee a recommendation as follows:

"Operating economics and pressure of public opinion and of governmental controlling bodies may result in the electrification of some extended portions of the railroads of the country much sooner than had been anticipated before the change in conditions brought about by the war.

"It should be the business of this Association to prepare the electrical industry as thoroughly as possible for this eventuality.

"It is exceedingly desirable that when electrification takes place on an extensive scale, it should be of such a character that installations not closely connected at the present time may be of such a standardized character that they will form parts of what will ultimately become a unified system.

"The method of attacking such a problem in the past has been for the different manufacturing companies to approach it from their individual standpoints and try out widely different methods which, though perhaps of equal value, could never be made a part of a standardized and unified system.

"It would appear that the importance of this question now warrants a broader treatment and that steps should be taken looking to the application of the engineering talent of the manufacturing companies to the development of apparatus and methods best for the country as a whole rather than for some more immediate and unquestionably short-lived commercial advantage for the individual manufacturer.

"There are four interests which must become closely associated if the problem is to be solved properly:

- 1st. The railroads
- 2nd. The power companies
- 3rd. The manufacturers
- 4th. The regulatory bodies of the Government

"It is very desirable that a plan should be made whereby these bodies may be enabled to undertake a solution.

"The Engineering Committee of the Pacific Coast Section of the National Electric Light Association regards this matter as being without exception the most important that is before it, and recommends to the Executive Committee of the Section that the latter should take whatever steps may seem to it proper to bring about the development of a standardized uniform system of methods and apparatus for the electrification of steam railroads.

"The Engineering Committee has not made any attempt to recommend the manner in which this suggestion should be carried out, but the assumption is that it will be referred to the various National bodies in some way."

This letter was transmitted by the President of the Pacific Coast Section to the President of the National body by the following letter of transmittal:

"The accompanying letter from the Chairman of the Engineering Committee of the Pacific Coast Section of the N. E. L. A. was presented before the meeting of our executive committee on Jan. 18th. As its subject, railroad electrification, is one of National rather than of local interest, it was felt that whatever might be done along the lines indicated in Mr. Barre's letter should be started by the National Association, rather than the geographic section.

"Consequently I am referring the matter to you for such action as its importance justifies. It would seem desirable to first take it up with the several manufacturers. When they give assurance that uniformity and standardization of

equipment is possible, the national engineering committee should be able to bring about the desired cooperation between the railroad and the power companies.

"I will greatly appreciate your advices from time to time regarding the progress of this matter, which gives promise of being of early and vital importance to this section."

It will be noted that the purpose of this recommendation was to bring up for consideration the possibilities of development of a system of railroad electrification of reasonable uniformity, particularly as applying to the necessities of the southwestern states.

Under the date of March 28th, 1919, the San Francisco Section of the American Institute of Electrical Engineers appointed a committee, of which Mr. J. E. Woodbridge is the chairman, to investigate the problem of railway electrification and keep the section advised of the available information on the subject. It has appeared to the Committee desirable that the Pacific Coast Section of the N. E. L. A. should keep in as close touch as possible with this committee and its activities and should give the San Francisco committee such assistance as it can.

(There follows an enumeration of papers which space will not permit of printing.)

ENGINEERING PROBLEMS IN THE WEST

INSULATOR COMMITTEE REPORT

H. L. Garbutt of the Westinghouse Company delivered a paper on the subject of Insulators which will be given in a later issue.

E. B. Snyder of the Ohio Brass Company spoke of the great recent improvement in porcelain body as developed by the manufacturers and also the improved manner of handling insulators during the process of manufacture.

Mr. Snyder stated that the handling given insulators was responsible in a large way for their successful operation. The manufacturers are planning on giving the insulator subcommittee their fullest cooperation in the tests of insulators.

C. O. Poole of the Southern Sierras Power Company stated that it was his opinion that the daily and annual cycle of temperature changes were responsible for a large part of those insulator failures not directly caused by outside physical reasons. His experience has been that out of some 10,000 to 15,000 insulators 98% of the failures occurred between the end of the pin and cap and that this was due to the expansion of the pin. He noted a particular batch of insulators manufactured in 1904 which had been giving years of service at 35,000 volts and then placed in operation on a 55,000 volt line in a very hot climate. During the last five years there has been but one failure in this batch of pin type insulators.

J. P. Jollyman of the Pacific Gas & Electric Company stated that in his opinion much better results would be obtained by a higher factor of safety in line insulators by the use of additional units since the cost of the insulators themselves was a small part of that of a steel tower transmission line. He mentioned his experience with insulators made in 1912 and that he had experienced no failures on 100 kv. lines and but very few on 60 kv. lines. On pin type insulators the percentage of faulty insulators during a twelve year period was given as 5%. These insulators were of four-part construction. He could not state that these failures or faults were discovered in any one particular part of the insulators but were distributed. He advocated the use of less severe tests on old insulators as they have shown that they are capable of insulating a line and they should not be broken by testing at extreme voltages.

R. S. Masson of the Arizona Power Company referred to the Hewlett type of insulators and gave it as his opinion

that one reason why he had experienced such satisfactory results with them was that there was a smaller mass of metal between discs and as a consequence the units nearest the line did not have to do all the work.

J. A. Lighthipe of the Southern California Edison Company stated that he had made some experiments on the Hewlett insulators on a short stretch of 60 kv. line and that there had been no failures in these insulators during the six years of the test.

Mr. McClelland of the Electrical Bond & Share Company, New York, stated that the Colorado Power Company has made extensive use of the Hewlett insulators and that since 1906 they have been almost entirely free from failures.

J. E. Woodbridge of the Sierra & San Francisco Power Company stated that there was one need of good insulators not ordinarily noted and that was that in many cases it was practically impossible to take a line out of service for the purpose of making any tests on the insulators due to the nature of the load. He indicated that more money might be spent to obtain insulators which could be guaranteed as being better in order to avoid the construction of additional lines.

D. J. Butts of the Western Electric Company stated that in the past great difficulty had been experienced in the manufacture of Hewlett insulators but that recent developments had enabled these insulators to be turned out in quantities at reasonable prices.

C. P. Osborne of the Portland Railway Light & Power Company stated that his company made annual tests with the Megger on all transmission line insulators and required them to pass a 200 megohm standard.

J. A. Koontz of the Great Western Power Company gave an outline of the proposed work of the Insulator Committee. It is planned to continue an extra elaborate series of tests to determine particularly the effect of temperature changes on insulators. It is hoped that investigations may also be continued on the subject of the porcelain body.

REPORT OF APPARATUS COMMITTEE

S. J. Lisberger of the Pacific Gas & Electric Company reported for the Apparatus Committee that they recommended the adoption of a standard for transformer polarity and that the subtractive polarity was much to be preferred.

EMERGENCY INTERCHANGE OF POWER

R. H. Ballard of the Southern California Edison Company spoke of the general advantages and duty of companies to interchange. He stated that he recognized the fact that the public was entitled to the avoidance of duplication of equipment and plants and that the greatest use should be made of all the facilities already at the disposal of any given territory. In his opinion it might well be considered a function of the regulatory bodies to compel the connection of power companies and the interchange of power.

President E. O. Edgerton of the Railway Commission said that a regulatory body would experience great difficulty in carrying out the proposal of Mr. Ballard, in that the assumption of such authority would extend itself to questions of the development of power and would have to decide as to which company of those interconnected should develop power first and in what quantities. It might also devolve upon the Commission even to determine in the case of interconnected systems, as to what new consumers should be supplied and which company should supply them. He stated that the question of interchange should finally result in consolidation, as this step would solve all the problems which would be difficult of solution in the case of interconnection.

Mr. McClelland of the Electric Bond & Share Company disagreed with President Edgerton in that his experience indicated that in the case of interconnected companies, no

difficulty was usually experienced in working out the solution of the questions referred to. Usually one or the other of the companies was more than anxious to permit the others to develop power or serve or refuse consumers.

H. A. Barre of the Southern California Edison Company gave it as his opinion that interconnection was a comparatively simple matter from engineering and operating standpoints and that it was purely a business question to be decided between the several managements.

C. O. Poole of the Southern Sierras Power Company noted a method of interchange of power which is to be accomplished during the coming year by the Southern Sierras Power Company and the Southern California Edison Company, California, by which Southern Sierras will operate a 6,000 kw. plant separate from the rest of their systems and transmit the power over one or two 135 kv. lines from Bishop to San Bernardino, a distance of 240 miles. At the latter point connection would be made directly to the system of the Southern California Edison Company.

D. D. Morgan of the Southern California Edison Company spoke of the operating troubles which might be experienced during the course of interconnection which could only be avoided by making interconnection at more than one point.

P. O. Crawford of the California-Oregon Power Company spoke of the great advantage of interconnection at those times when it was necessary to take a large generating unit out of commission for purposes of repair.

R. J. C. Wood of the Southern California Edison Company pointed out the large particular saving to be obtained by the use of economy in steam plant operation through operation on block loads at a consequent increase in efficiency which would be further increased by the improvement in load factor by interconnection.

REPORT OF COMMITTEE ON LINE SAFETY CODE

S. J. Lisberger of the Pacific Gas & Electric Company reported for his committee that they had prepared a code and had transmitted it to the Railroad Commission for approval and issuance as an order of the Commission.

L. S. Ready of the California State Railroad Commission stated that this code was now being subjected to the scrutiny of the Commission by means of comparisons between it and the several systems. A field inspection is being carried out covering the whole state, which, when completed, will enable the Commission to give their conclusion. He stated that in his opinion, a code formed by those of the industry in this state would be of very much greater value to us than any code issued by the Bureau of Standards, since our conditions were so vitally different from those in the East. Of necessity the code issued by the Bureau of Standards would be very complex in its phases so as to be applicable to such a large territory.

RELAY PROTECTIVE SYSTEM

F. E. George of the Pacific Gas & Electric Company agreed with the author of the paper in that the Western companies should be more energetic in their study and application of relay protective systems. His experience was that the use of more than one relay at a certain point was a very good policy in that a broader range of conditions was met. His company has not had a very satisfactory experience with the use of relays at line potential. The present state of the art has required that auxiliary switches be installed to limit the operation of certain relays at certain times. This would indicate that large improvements in relays are yet possible.

Mr. Halpenny of the Southern Sierras Power Company noted that the rapid expansion of systems into complicated network made the subject of relay protection one of great importance in that the addition of lines tended to add to the number of interruptions suffered by a station rather than

to increase the reliability of the service unless proper steps were taken to protect against failures. The increasing use of outdoor equipment indicates that the use of relays at line potential may be greatly limited.

J. P. Jollyman, Pacific Gas & Electric Company, questioned the availability of the balanced relay for use on B-Y connected grounded systems or on delta systems at the time of the occurrence of a ground some distance from the location of the relay. He pointed out that the use of relays intended to operate on a slight increment in current at the time of a short, was impractical and in his opinion a relay based on the balance principle would be much more satisfactory in such cases. Mr. Jollyman also stated that the field is not yet fully covered and that the manufacturers should give more attention to this matter.

J. A. Koontz of the Great Western Power Company emphasized the necessity of analyzing the case before attempting to design a suitable protective scheme for application to any system.

J. E. Woodbridge of the Sierra & San Francisco Power Company stated that his years of experience with relays indicated that usually at the time of a severe short circuit, the relays did not perform the function for which they were designed, often because of mechanical failures of the relays themselves, due to the large magnetic forces. He deplored the fact that relays are not given the careful attention in manufacture to fit them for the work they are required to do.

Mr. Morris of the Westinghouse Electric & Manufacturing Company said that in a way the West was more progressive than the East in that if we did not find a relay on the market which fitted our needs, we made our own relays.

H. H. Cox of the Southern California Edison Company asked what provision could be made for compensating the relay settings between those times when the capacity of the generators connected to the system varied.

L. A. S. Wood of the George Cutler Company of Indiana brought out the fact that one of the first necessities of an analysis for the purpose of applying protective devices was a study of the past history as regards interruptions, and in this way the location of the point or points at which it is possible to install protective relays.

G. E. Armstrong of the Southern California Edison Company stated that his intentions were to avoid the use of any relay which depended for its action upon the absolute value of voltage or current. In this way many of the faults of the present relays and the necessity for careful calibration and testing would be eliminated. Further, all the installations proposed were devised so that no attention was necessary on the part of the operators. The question of outdoor relays at line potential was answered in that these relays would be shielded by small covers and the necessary power for moving along a heavy insulating stick would be obtained by placing a small battery on an insulator and in this way avoiding the likelihood of failure to operate due to small energy available.

AUTOMATIC INDUCTOR GENERATING PLANTS

C. E. Valk of the General Electric Company stated that many of the smaller water powers not now developed could be developed by the use of automatic generating plants, but that in his opinion the synchronous generator was much to be preferred above the induction generator and that the increased cost of the former would be only 15%. He further stated that the real secret of the successful operation of automatic plants was in providing capable, intelligent supervision for the apparatus installed.

P. M. Lincoln of the Westinghouse Electric & Manufacturing Company stated that even in a small plant human intelligence must be applied even through the person of the inspector, or by the addition of sufficient relays which would

give this effect. In his opinion the field for automatic generating plants was limited to the smaller size plants.

J. H. Lighthipe of the Southern California Edison Company stated that the development of the electrical interest in California was through the development of small plants and that the time is now here for the conversion of these plants into automatic operation. He further stated that the present magnitude of the systems was such that the smaller plants might be automatically removed from the line at the time of trouble without loss.

J. Hood of the General Electric Company said that it was the labor cost in plants of low load factor and small plants which was the determining factor and that the use of automatic equipment was the only way in which they were economically possible.

E. A. Quinn of the San Joaquin Light & Power Company stated that he expected these automatic stations to pay for themselves in three years. These plants have been operating at approximately 75% power factor.

CONVERTING STEAM PLANT TO STANDBY OPERATION

W. Euler of the Great Western Power Company stated that in his opinion a double bus was absolutely necessary in a standby steam plant so that it would be possible to transfer load from the plant to the transmission lines in case of failure. Direct connected exciters were much to be preferred to standby plants. The cross connecting of dry vacuum pumps is another desirable feature.

R. J. C. Wood of the Edison Company called attention to the cooling of turbine blades when a machine is floated on the line and referred to certain investigations he had made which indicated that a small quantity of steam admitted to the header would permit the blades to operate at no more than normal temperature.

R. S. Masson of the Arizona Power Company stated that during one month his 5,000 kw. plant had operated on an 8% load factor and during this time he had obtained an economy of 78 kw-hr. per barrel.

KILOWATT-HOURS PER BARREL OF OIL

R. J. C. Wood of the Edison Company stated that his practice was to consider the economy of a steam plant as being the net delivered to the transmission system, even going so far as to discount from the net output during any period that amount received by the plant from the transmission lines when the turbines were floated. In his opinion it was not just to any plant to compare it against another on a kw-hr. per barrel basis in that the character of the prime movers might be radically different and each of the plants might be operating on what to it would be a 100% basis.

Mr. Wyatt of the Los Angeles Gas & Electric Corp. pointed out that the many factors entering into ultimate economy of a generating plant made a comparison on a kw-hr. per barrel basis very unreasonable.

F. O. Dolson of the Southern Sierras Power Company stated that his practice was to subtract the amount of power used for auxiliaries and for floating on the line from the gross output and the net result was therefore the actual energy delivered to the lines.

Session of Friday Afternoon, May 2, 1919

MAGNAVOX

P. L. Jensen of the Magnavox Company gave a very interesting explanation of the devices manufactured by his company and explained their application to aeroplanes and other uses evolved during the war. This device was recently demonstrated in Washington, D. C., at which time an aviator, in an aeroplane 3000 ft. above the Treasury Department, read to an assembled audience of 50,000 people President Wilson's

Victory Loan address. Every word spoken by the aviator was clearly heard by the audience. Mr. Jensen demonstrated the fact that his transmitter is impervious to extraneous noises by speaking through it while it was being held in the funnel of a phonograph. Those not having receivers could not hear what he said from a distance of ten feet, due to the noise of the phonograph, but through the receivers only Mr. Jensen's voice was heard.

J. A. Lighthipe of the Southern California Edison Company pointed out the fact that the loud speaking receiver and sound-proof transmitter should be of inestimable value to operators in noisy power houses. He further pointed out that it should be possible by means of these devices for the operators to be able to transmit and receive instructions without the necessity of leaving the operating board and entering a sound-proof booth.

H. A. Barre of the Edison Company stated that Mr. Jensen's remark that it might be possible through an elaboration of this device to mitigate the effects of inductive interference, is worthy of careful consideration, in that it might indicate that the telephone companies may be in a position themselves to effect some steps to decrease the evils of interference without requiring the power companies to expend large sums to avoid interference.

PULVERIZED FUEL

R. J. C. Wood of the Edison Company emphasized the fact that the dust problem in connection with the use of pulverized coal should be carefully considered when comparing the relative merits and costs of coal and oil. The fact that the pulverized coal of California contains a relatively high sulphur content, would indicate that the tubes and drums of the boilers would be subjected to an increased danger from corrosion, due to the formation of sulphuric acid at those times when the boiler was cooling down and the steam and moisture in the furnace condensed on the surfaces of the metal.

H. E. Linden, of the Beckman & Linden Engineering Corporation, called attention to the fact that Mr. Delany's quotation of a boiler efficiency of 75% for pulverized coal was somewhat low as indicated by a number of tests from which he quoted the fact that boiler efficiencies were found to range from 78% to 82%. Mr. Linden further stated that his experience was that Mr. Delany's figure of \$1.00 per ton is somewhat high and quoted cost of pulverizing as being from 55c to 35c per ton in daily capacities of from 100 to 1000 tons. Mr. Linden stated that approximately 10,000,000 tons of pulverized coal are being used annually in the United States. It is of utmost importance to dry the coal to prevent spontaneous combustion in the storage bin. Hot powdered coal cannot be stored, but cool powdered coal will give no trouble whatever.

Mr. Buell, Ione Coal Mine Company, called attention to the fact that our natural deposits of crude oil are being consumed at a very rapidly increasing rate and that at the present time we have consumed forty per cent of our available supply. Powdered coal experts have generally advocated enlarging the size of combustion chambers by raising the boilers or building dutch ovens in front of the main setting for the purpose of burning powdered coal.

P. M. Downing, of the Pacific Gas & Electric Company, said that more complete tests of this fuel on a large scale were imperative before serious consideration should be given to extensive use.

S. J. Lisberger, of the Pacific Gas & Electric Company, called attention to the large installation costs which would be required in order to make effective the efficient burning of this fuel. Dry storage in locations adjacent to the coast would be very difficult of attainment when the large quanti-

ties of fuel necessary for the operation of a plant of any magnitude is considered. The troubles which would be experienced in furnaces and arches through the use of this fuel in place of crude oil would be largely increased due to the relatively high furnace temperatures attained. Coal in this form will not stand one week in metal containers, although storage of a period up to 14 days might be reached in concrete tanks.

EXTENDING THE RANGE OF ACCURACY OF WATTHOUR METERS

J. A. Leach, Jr. of the Pacific Gas & Electric Company pointed out that revenues were based not only on the accuracy of meters but also upon the confidence of the consumers and this latter would be enhanced by the extensive use of any devices which would show that the power companies were doing all in their power to give the consumers a square deal.

C. M. Hoag of the Southern Sierras Company pointed out that the field for the use of the device developed by Mr. Knopp was just beginning to open up due to the fact that the use of larger capacity lamp-socket appliances is in its infancy.

J. P. Jollyman of the Pacific Gas & Electric Company stated that some of the manufacturers had agreed to incorporate this device in meters as manufactured if the customers were willing to pay an increased cost which would amount to some 15 to 20 cents per meter.

H. A. Barre said that in his opinion the most valuable adaptation for this device would be on meters measuring the consumption of large consumers where a very small percentage variation in accuracy would mean a comparatively large sum in money.

J. C. Abell of the Western States Electric Company said that the tests reported by Mr. Knopp, covering only a small number of meters, should not be accepted as a final proof of the value of this device in showing the amount of increased revenue.

ELECTRIC WELDING

John Hood had, at the convention, an electric welding outfit and made demonstrations. This particular outfit operated on the constant current theory and the current was supplied by a constant current generator. Samples of welds were made which thoroughly indicated that welds made by using metal electrodes with direct current were homogeneous and connected to the parent metal.

F. A. Anderson of the United States Shipping Board outlined the recent developments leading up to the present state of the art of electric welding due to pressure of war conditions. Mr. Anderson called particular attention to the theory of the transmission of metal from the electrode through the arc to the weld. His observations indicated that for a successful weld the metal must pass in a constant stream, giving the appearance of a stream of molten metal flowing from a small tube, extending from the electrode to the weld. Only when the process is conducted in this manner will a perfect weld be obtained. In his opinion alternating current arc welds were not commercially successful. He advocated the use of the variable voltage system.

W. B. Sawyer of the United States Steel Products Company in his remarks on the electrodes used for welding, clearly indicated that no one definite specification for electrode material could possibly cover every case, but that variations in the analysis would produce material which could be closely fitted to the needs of the individual cases or character of metals to be welded. Three important points determine the proper combination for electrodes: character of material, chemical composition and physical structure.

PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

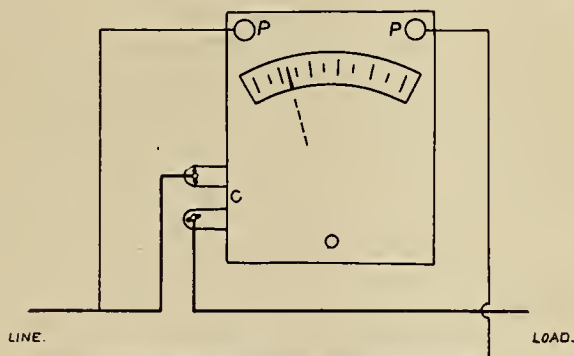
(What is the relation between a kilowatt and a horsepower? What is meant by efficiency? If you are selling electricity or electrical devices, or even if you are merely one of its users, there are a thousand simple questions which arise in your daily needs. These you may answer for yourself by taking advantage of the extension course offered by the Universities of California and Oregon. These articles appearing in the Journal of Electricity are used as a text—back numbers will be furnished for those beginning late.—The Editor.)

Editor's Note: Through an oversight in the editorial office, the fourth article of this series was run in place of the third in the issue of May 1st. The third article is here given with the drawing to which reference is made in the text reproduced as Figure 1. For other illustrations pertaining to this subject refer back to pages 440 and 441 of last issue. Figure 2 on page 491 of this issue is the Figure 1 referred to in the article appearing in the May 1st issue. In the second article of the series, appearing April 15th, the first paragraph on page 390 should read, "In a series circuit the current is the same everywhere" in place of the text as it now stands.

POWER — LOSSES — EFFICIENCY

In stating the "power" of a motor we tell not only how much the machine can do but also how quickly it can do it. A single horse is able to haul an automobile to the top of a certain long hill, but it takes a 40 horsepower engine to perform the work in five minutes. We have, then, two factors which determine the amount of power, the force required and the rate at which it drives the load.

In an electric circuit we have what corresponds to a force (the "voltage" or "pressure") and a quantity of electricity which is driven through the wires by this electromotive force. The rate at which the electricity is carried is indicated by the number of



The wattmeter—the reading depends upon both voltage and current.—
Figure 1

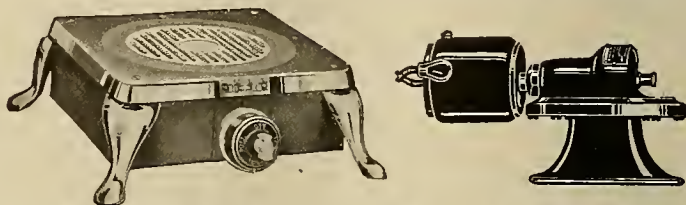
amperes of current, or "coulombs per second." Both the voltage and the current, then, are factors in the power necessary to force electricity around a circuit.

It has been agreed that the simplest practical unit of power would be that required to drive one ampere by a pressure of one volt. This unit is called the "watt" in honor of the man who gave the world its first notions of power. Then if one volt drives current at the rate of 3 amperes, the power is 3 watts. If it takes 2 volts to drive 3 amperes, the power is twice as much, or 6 watts. In general, the number of watts equals the product of the number of volts times the number of amperes.

This statement holds good in direct current cir-

cuits and in those alternating current circuits which include no coils, condensers or long parallel lines. With one or more of these, there are reactions which reduce the power requirement below the number of "volt-amperes." The following expression is correct in all cases:

$\text{Watts} = \text{volts} \times \text{amperes} \times \text{power factor}$,
where the "power factor" is equal to one or less, generally expressed as a percentage. It varies from 60% to 90% in most cases of alternating current motors and transformers, and is 100% for heaters,



WESTERN ELECTRIC HOT PLATE AND KLAXON HORN

Here are two devices for transforming electric energy into other forms—sound in the Klaxon horn and heat in the hot plate. The latter takes 4 amperes on a 220 volt circuit—how many British thermal units will it give out in an hour? If one-half of the heat escapes to the air, how hot will a gallon of water (8 lbs.) get in half an hour if its temperature is 60° when it is set upon the hot plate?

resistance boxes, incandescent lamps, etc., and for all direct current circuits.

Watts, Kilowatts and Horse Power.—The direct current load carried by an average power house may be 2000 amperes at 550 volts. The output of the machines, then, equals $550 \times 2000 = 1,100,000$ watts. This is too large a number to be handled conveniently, and it is customary in all such cases to use a larger unit, namely, the "kilowatt," which equals 1000 watts. Then the load above is expressed as 1100 kw. (kilowatts). The general formula is:

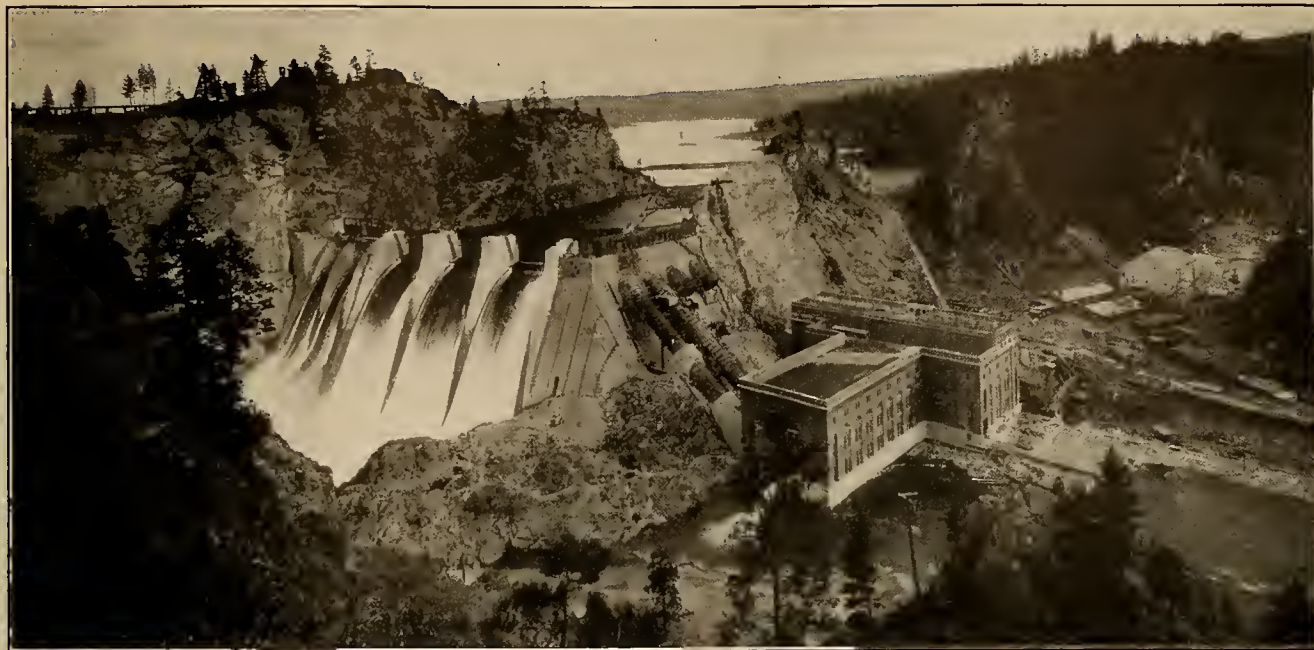
$$\text{Kilowatts} = \frac{\text{volts} \times \text{amperes} \times \text{power factor}}{1000}$$

It is perfectly feasible to measure the power in electric circuits in terms of the "horse power," which was invented primarily for such machines as the steam engine. It has been established by calculation and measurement that one horsepower equals 746 watts, or approximately $\frac{3}{4}$ kw. Thus it is possible to transfer quantities from one system to the other with little difficulty:

$$20 \text{ hp. (horsepower)} = \frac{3}{4} \text{ of } 20, \text{ or } 15 \text{ kw., and } 50 \text{ kw.} = \frac{4}{3} \text{ of } 50, \text{ or } 66.7 \text{ hp. (approximately).}$$

Power Measurement.—The horsepower output of a gas engine is conveniently measured mechanically by making it move a load. One horsepower is required to lift one pound at the rate of 550 feet per second, or to lift 550 lbs. one foot per second. For calculation,

$$\text{Hp.} = \frac{\text{pounds pull} \times \text{feet per second}}{550}$$



LOGLAKE DAM, WASHINGTON

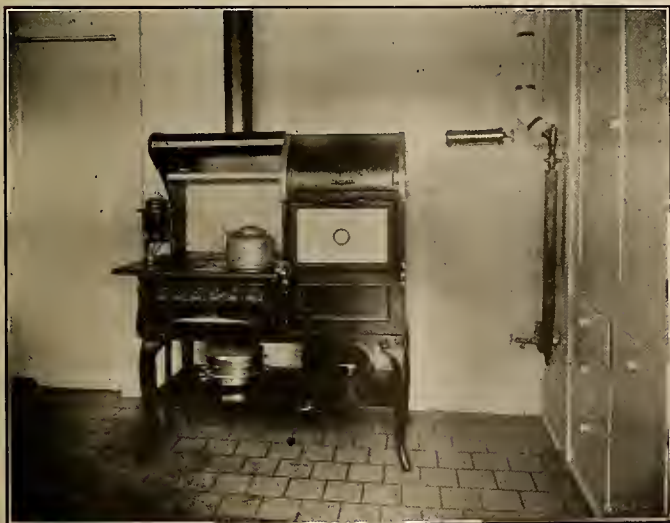
Hydraulic energy is converted to electric energy in this power plant, situated near Spokane, Wash. The generators when they are all installed will give a combined output of 56,000 kw. If their efficiency averages 92%, what will the input be? What will then be the hydraulic horsepower received by the turbines, if their efficiency is 85%?

Electric power may be measured either by means of a wattmeter, connected as shown in Fig. 1, or by a combination of ammeter, voltmeter and power factor meter. The power factor meter is, of course, not used with circuits which are known to have 100% power factor. The wattmeter has both a "pressure coil" (terminals at P in Fig. 1) and a "current coil" (terminals at C), and their reaction

voltage drop is then 20 volts. The power given the line by the generator = $250 \times 50 = 12500$ watts or 12.5 kw. That delivered by the line = $230 \times 50 = 11500$ watts or 11.5 kw. There is a loss of power of one kw. which is used up in forcing the current through the wires.

Such a loss always occurs, and it results in heating the wires, just as the energy expended in moving a train changes to heat in the parts where there is friction.

It is possible to calculate the watt loss in a d.c. circuit by multiplying the voltage drop in the line by the current, as the watts in any part equal volts across that part times amperes. Thus in the example above we find $20 \times 50 = 1000$ watts. Furthermore, since the volt drop equals ohms \times amperes, the watt loss = ohms \times amperes \times amperes, or the



INSIDE THE FARM HOUSE

This installation of an electric range and an electric water heater in a ranch home in California uses \$6.00 worth of electric energy per month at a rate of 3 cents per kw-hr. What was the average current taken, if the apparatus was used on a 110 volt circuit 5 hours a day for 30 days?

upon each other determines the reading, which is thus proportional to both volts and amperes. On a.c. (alternating current) circuits the wattmeter is able to take account of power factor also.

Losses and Efficiency.—The voltage at the generator end of a short d.c. (direct current) transmission line is 250 volts. At the receiving end a voltmeter reads 230 and an ammeter reads 50. The

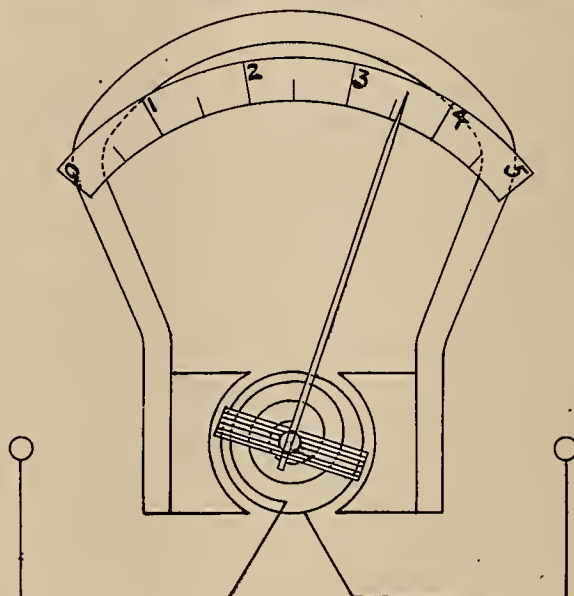
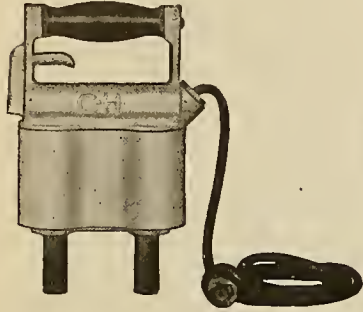


Fig. 2.—Current entering the ammeter through the spiral spring makes the coil and its iron core an electromagnet. This is the figure 1 referred to in the text of the article on electromagnets appearing in the May 1st issue.

product of resistance times the square of the current. This last is a most important relation, and it applies to all circuits, both d.c. and a.c.

When we speak of the "efficiency" of a transmission system we have in mind a comparison of the power delivered with power put into the line at the generating end. Strictly, the efficiency is the number found by dividing the "output" of the line by the "input." As an example, consider a system which



This is a hand magnet used in various ways such as the handling of hot castings, removing iron and steel from materials for making solder and recovering nails from sweepings.

delivers 9,000 kw., the current being 800 amperes and the total line resistance 3 ohms. The loss = $3 \times 800 \times 800 = 1,920,000$ watts, or 1,920 kw. The input to the line = $9,000 + 1,920 = 10,920$ kw. Then the efficiency of transmission = $9,000 \div 10,920 = .824$, which is 82.4%.

A mechanical machine, such as a waterwheel, may give out 40 h.p. while receiving 50 h.p. from the water. Its efficiency = $40 \div 50 = 80\%$. No machine has ever been made with efficiency as great as 100%, for some of the energy put in is always lost by friction. No transmission of electricity is 100% efficient, for energy is always converted into heat in overcoming resistance.

FIVE KNOWN KINDS OF ICE

There are, according to a recent article in the New York Sun, no fewer than five distinct kinds of ice. First, there is the common ice, which is water frozen at ordinary atmospheric pressure. This is called Ice I. It is from 10 to 13.5 per cent less dense than water.

If this is placed under a pressure of about 1000 kilograms the ice melts to water. If the pressure is increased to about 4400 kilograms the liquid water freezes again to another kind of ice called Ice V, which is about 6 per cent denser than water.

Increasing the pressure to about 6500 kilograms we get Ice IV, the volumic pressure and the density becoming from 5 to 9 per cent greater than water.

If we freeze water at atmospheric pressure, but with a temperature of -30 degrees C., ordinary ice (Ice I) is changed to Ice III, which is on the average 3 per cent denser than water and 20 per cent denser than Ice I.

Further increasing the pressure, Ice III turns into Ice II, which is about 22 per cent denser than Ice I. On further increasing the pressure Ice II changes to Ice IV and then to Ice V.

Sometimes these changes take place so quickly that a click is heard. The lower the temperature the more slowly is the change effected.

Merchandising Problems

(Notes from various field representatives of the California Electrical Cooperative Campaign—and one of the problems of the dealer in the larger city as met by the representative of the campaign in San Francisco and the bay region.—The Editor.)

WHERE WILL WE PUT THE WASHING MACHINE?

BY C. C. DAVIS

In discussing washing machines recently with the demonstrator of the Kimball Electric Company, of Oakland, it was remarked that it was a hard matter to find a place to put the washing machine.

This remark would at first seem ridiculous, but on a moment's thought there will be found much truth in it.

Building has taken rather a queer turn in the Bay region. The good old-fashioned cellar with a spacious laundry is seldom seen. The climate does not require such a place for storing foodstuffs, and as the grading and walling in is quite expensive, it has been discarded as a needless extravagance. The majority of the dwellings are of two stories, and built rather close to the ground, so have none of the advantages of the cottage with the high basement, so popular in other sections of the state.

The washing is usually done on the back porch, which is the essence of compactness; in fact, it is condensed to the limit. These back porches are heritages left the occupants by a penurious owner, a thoughtless architect and a cheap contractor. So the question, "Where will we put the washing machine?" is not so ridiculous after all.

The washing machine and the domestic sized mangle have come to stay, and provision must be made for them in all new homes. There must be provided floor space, electrical outlets for connecting up the various devices, and hoppers for suitable drainage.

Our electrical contractors and dealers can accomplish much in this regard, by a little missionary work. It means more sales of devices and more outlets.

CAMPAIGN FIELD NOTES

Gleaned from Reports of Field Representatives

Central California Electric Company.—Mr. Clyde Smith of Fresno has added the room next door to his attractive electrical store and is operating it as a washing machine store.

Selma Electric Company.—Mr. Limegrower has become greatly interested in the work of the Cooperative Campaign. He gave to Field Representative Brainerd his application for membership in the California Association of Electrical Contractors and Dealers.

A. R. Parsons, Porterville, reports that the cooperative appliance solicitor and the campaign in connection with his work in Tulare county have created a great interest in electrical appliances.

A. E. Holloway, San Diego Consolidated Gas & Electric Company, proposes to place in a frame in his company's office a card showing the names, addresses and telephone numbers of the electrical dealers in San Diego. Employees of the central station will then be able to easily and impartially refer consumers to this list.

SPARKS—Current Facts, Figures and Fancy

(Wireless concerts and long-distance lectures, a floating convention, and the startling achievements of a single grain of rice are some of the latest novelties presented here for the entertainment of the curious reader. You are also informed how you may eventually solve the servant problem, and of the risks you run when filling the gasoline tank of your automobile. —The Editor.)

The neutral countries have not escaped war prices. In Sweden the living expenses of a normal family have been increased by 142 per cent between 1914 and 1918.

* * *

It is estimated that one grain of rice sown will produce a harvest of fourteen thousand grains. The electric pumps used in the irrigation of California rice are an important support of this remarkable branch of agriculture.

* * *

In cases of shell shock and other nervous disorders occasioned by war, music has proved to be of incalculable benefit. The American Red Cross is making an appeal for musical instruments of every kind to supply this demand.

* * *

The postage stamp was officially adopted in 1847. In that year the total number of pieces of mail matter handled by the United States post office was 124,173,480. In 1913, which is the last estimate made, it was 18,567,445,160.

* * *

In connection with a zone-system of fares advocated in New Jersey, a pay-as-you-leave plan is suggested. Two cents is charged for the first mile, an additional cent for the second and so forth, each passenger receiving an identification zone slip on leaving.

* * *

Music by wireless is one of the recent achievements of the radio department of Rockwell field, the music of a Victrola aboard the "Marblehead" being transmitted to San Diego for an entertainment there. A similar delivery of music by telephone was one of the enjoyable features of the Coronado convention.

* * *

A new passenger air liner, constructed by a British company recently made its trial trip carrying twelve passengers, pilot and assistant. It attained an altitude of over six thousand feet in $7\frac{1}{4}$ minutes and an air speed of 125 miles an hour. It seems that air-travel will soon hold an important means as a means of passenger-transportation.

* * *

It has been ascertained by experiment that in the filling of gasoline tanks of motor vehicles there is danger of a static discharge of electricity, from tank metal hose or funnel used to transfer gasoline across the opening of the gasoline tank being filled. The gasoline passing through chamois stretched over the funnel will generate a charge great enough to cause a spark unless the funnel is kept in contact with another metal surface while the gasoline is being poured.

Electric street cars afford a striking contrast to the older methods not merely in speed but in cost of operation. The old horse tramways in London were worked at the rate of seventy-two cents a mile for two horses, this being chiefly due to the fact that the horses, bought at the age of five years, had to be sold at a loss after four years of work.

* * *

A foreign-trade convention held during a ten days' trans-Atlantic voyage is the newest departure in the commercial world. The convention however proved that it was not at sea in any other than the literal sense. It held regular formal sessions and accomplished as much in the way of progressive discussion as any gathering of the kind held on shore.

* * *

In England electrically treated wheat has been shown to produce 15 sacks per acre as against 12 sacks per acre of untreated wheat, the straw of the treated crop being one-fifth more than the untreated. A crop of treated barley yielded half as much again as the untreated. The process has also been tried with turnip, cabbage, tomato, cotton and other seeds, with good results.

* * *

Russia continues to surprise the world by reversing the recognized order of things. For instance, in the operation of railways, wages and salaries of workmen, line guards, clerks, etc., have been increased to such an extent that they are greater than the salaries of the superintendents and chiefs of the departments. It is said that this has increased the expenditures about 300 per cent.

* * *

According to some prophets the millennium is merely a question of electricity. Domestic servants, dishwashing, housecleaning, kitchen stoves and other laborious factors in daily life are to become obsolete, replaced by invisible magicians in the form of electrical devices. It is even threatened that concerts and lectures will be delivered to us in our own homes, and moving pictures projected there, from a central agency.

* * *

The Department of Chemistry at the University of California has made a number of valuable discoveries during the war. Coloring matters for dyes, oils, tanning materials and substitutes for rubber have been extracted in experiments with California trees and shrubs. Redwood stumps have been found to yield phenol from which many of the high explosives are made. Glycerine has been made from sugar instead of from fats as formerly, and tartaric acid from starch instead of grapes, both more inexpensive sources.

PERSONALS

A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, was elected president of



the Pacific Coast Section, N. E. L. A., for the coming year at the recent convention of that organization held in Coronado April 28 to May 2. Mr. Wishon has long been active in the association's interest and this appointment comes as a well deserved recognition of his services. His quiet energy and enthusiasm, so familiar to those who have worked with him in this and other lines of activity, have been devoted always to the

upbuilding of the industry as a whole and the association looks forward to a year of active service under his guidance.

Max Thelen, formerly president of the California Railroad Commission and now director of public service of the U. S. Railroad Administration, has been spending some time on the Pacific Coast. Mr. Thelen has taken up matters of local adjustment such as the handling of freight traffic and has also had occasion to address various gatherings of importance on the present railroad situation. He spent some days in San Francisco and since has gone to Salt Lake City.

W. C. Gill, a prominent contractor-dealer of Reno, Nev., was a recent San Francisco visitor.

H. F. Schultz, salesman for the Electric Appliance Company, is going out into southern territory.

W. V. Banister, who is connected with Stone and Webster interests at Long Beach, Cal., was a recent San Francisco visitor.

E. B. Strong, president of the Technical Publishing Company, has recently returned to San Francisco from a several months' trip throughout the East.

R. H. Ballard, vice-president of the Southern California Edison Company, is attending the N. E. L. A. convention at Atlantic City.

M. V. Watson, manager of the Arizona Power Company from Prescott, Arizona, is reported as in attendance at the joint conventions at Coronado.

T. E. Bibbins, president of the Pacific States Electric Company, has gone East to attend the Atlantic City convention and will touch at other points en route.

L. J. Bergman of Pass & Seymour, Syracuse, N. Y., was among the welcome guests from that far distant city in attendance at the recent gathering in Coronado.

Frank Boyd, local manager of the small motors department at San Francisco, stopped off at the Coronado conventions on his way back from a recent eastern trip.

C. B. McCullough, head of the civil engineering department of the Oregon Agricultural College, has accepted the position of state highway bridge engineer of Oregon.

G. F. Kirkpatrick, salesman for the Pacific States Electric Company with headquarters at Seattle, has returned to Seattle after two weeks spent in the Spokane territory.

Lieut. R. T. Strong, of the U. S. S. Marblehead, has recently received his discharge from the service. He will spend a few weeks in San Diego before returning to his home in Portland.

J. F. NePage of NePage, McKenny Company, electrical engineers and contractors, Armour Building, Seattle, visited the Portland offices of the company recently on business.

D. R. Bullen, manager of the supply department of the General Electric Company from Schenectady, N. Y., brought greetings from the East to the joint conventions at Coronado.

N. R. Stansel of the Southwest General Electric Company of El Paso recently made the trip to California to attend the Pacific Coast N. E. L. A. convention at Coronado.

H. L. Aller, general manager of the Pacific Gas & Electric Company of Phoenix, Arizona, was one of those in attendance at the recent Pacific Coast Section, N. E. L. A. convention.

F. D. Schwartz, western manager of the Indiana Rubber and Insulated Wire Company of Jonesboro, Indiana, is a recent Pacific Coast visitor. Mr. Schwartz' headquarters are in Chicago, Ill.

W. R. Elliot of the Salt River Valley Water Users' Association is a recent visitor to California, where he took in the Coronado convention of Pacific Coast electrical men held April 28 to May 2.

W. W. Mumma of the Myers & Robbins Company from Springfield, Ohio, has been spending some time in California—part of it at the Coronado convention which was the feature the first of the month.

J. R. Lovejoy, vice-president of the General Electric Company of Schenectady, and J. A. Cranston, Northwest manager of the company with headquarters in Portland, recently spent some days in San Francisco.

E. B. Snyder of the Ohio Brass Company of Mansfield, Ohio, has been visiting the Western coast in the interest of his company. He was among those present at the recent convention in Southern California.

A. L. McCarthy, vice-president and general manager of the Eureka Vacuum Cleaner Company of Detroit, plans to make a trip to the Pacific Coast in June with the object of establishing sales sections in the West.

W. Brewster Hall, of Pass & Seymour, Syracuse, N. Y., was in attendance at the Coronado conventions, where he seemed to have fully recovered from his recent accident in Portland. No crutches were in evidence.

W. R. Putnam, prior to his leaving for Boise, Idaho, to become vice-president and general manager of the Idaho Power Company, was tendered a farewell banquet by the entire electrical fraternity of Salt Lake City, on April 28th. About 150 men representing all branches of the electrical industry were present.

A. L. Kempster, manager of the Seattle division of the Puget Sound Traction Light & Power Company, an expert

street railway man, has gone to New York City, where he has been called to assist in the solution of transportation problems of the Interborough Rapid Transit System. The Interborough Consolidated Corporation, which is the largest city transportation company in the United States, was placed in the hands of a receiver on March 21st, 1919, by the United States District Court. The interborough companies op-



erate the elevated, surface and subway lines of the city and control the Interborough Rapid Transit Company and the New York Railways. Mr. Kempster's long experience in the street railway business and expert knowledge brought him the appointment.

H. L. Garbutt, formerly manager of the line materials section of the supply department of the Westinghouse Electric & Manufacturing Company, has recently been made local supply manager of that company in San Francisco.

O. B. Moorhead of San Francisco, president of the Moorhead Laboratories, Inc., made a recent trip to Seattle to attend the annual meeting of the corporation, which is incorporated under the laws of the state of Washington.

R. C. W. Libbey of the Simplex Electric Heating Company of Cambridge, Mass., has recently been visiting the Pacific Coast. While here he attended the Pacific Coast Section, N. E. L. A. convention and made and greeted many friends.

A. P. Merrill, formerly division manager for the Utah Power & Light Company, at Provo, has been promoted to fill the position of manager of the Ogden division for the same company, succeeding P. M. Parry, recently appointed commercial manager.

Stacy Hamilton and C. P. Osborne represented the Northwest Power Association at Coronado in the friendly exchange of interest which has played such a pleasant part in the relationship of this society with the Pacific Coast Section, N. E. L. A.

E. O. Shreve, San Francisco manager, and John Hood, San Francisco engineer with the General Electric Company, went East immediately after convention to look into new industrial developments in that region and to visit headquarters at Schenectady.

A. D. Page of the Harrison, N. J., Edison Lamp Works represented New Jersey at the Coronado gathering. There were twelve states other than California represented at the convention—one of the features which gave the particular charm to that event.

Colonel H. C. Sparks, C. M. G., member of the Council of the British Institute of Electrical Engineers with headquarters in London, is a recent San Francisco visitor en route home to England. Colonel Sparks is at present investigating the uses of pulverized coal.

R. C. Starr, formerly with Stone & Webster Company, in charge of construction work on the Big Creek installation of the Southern California Edison Company, has been made chief construction engineer for the new installation work of the San Joaquin Light & Power Corporation.

C. E. Wiggin, who addressed the Electrical Credit Association of the Pacific Coast at their recent dinner in San Francisco, should have been credited in the last issue with being head of the electric department of Dunham, Carrigan & Hayden, in place of the credit department.

E. M. Cutting of the Edison Storage Battery Company, and Mrs. Cutting, were among those feted at the recent Coronado conventions. Ed. Cutting was a familiar figure to the industry, but this was Mrs. Cutting's first convention, she not having been Mrs. Cutting for any great length of time.

Capt. R. W. A. Brewer, who as inspector for the British government stationed in Stockton and later in San Francisco, made so many friends on the Pacific Coast, has definitely decided to remain in this vicinity and has opened offices in San Francisco as a consulting engineer and technical adviser.

Henry Bostwick of the Pacific Gas & Electric Company, and Robert Sibley, editor of the Journal of Electricity, composed the resolutions committee of the recent Coronado conventions. Mr. Sibley was removed from the committee, however, before the resolution thanking the Journal of Electricity was suggested by the president.

John R. Brownell, formerly safety engineer with the California Industrial Accident Commission, has resigned to take charge of group and business insurance for the Equitable Life Assurance Company of New York, with headquarters in San Francisco. Hugh M. Wolfelin takes Mr. Brownell's position with the accident commission.

E. Parry, formerly Chief Electrical Engineer to the state of New Zealand, is now on the way to London to take the position of Engineer in Chief to the English Electric Company, a new combination of some half-dozen existing engineering firms. His successor in New Zealand is Lawrence Birks, now located in Wellington.

H. Etchells, a co-inventor of the Greaves and Etchells electric furnace with headquarters in Philadelphia, is a recent Pacific Coast visitor. While in the San Francisco district Mr. Etchells visited the recent six ton three phase electric furnace that his company, the Electric Furnace Construction Company, has recently installed at the Mare Island Navy Yard.

C. F. Elwell, formerly connected with the Federal Wireless Company of San Francisco, who went to Europe five years ago in connection with his work and has been erecting wireless stations in France and England, has recently been decorated with the Cross of the Crown and made a cavalier by the king of Italy. This is in recognition of his services to Italy during the war. Elwell is a graduate of Stanford University.

C. E. Grunsky, well known consulting engineer of San Francisco, has recently returned from a business trip to New York, Washington and Chicago. While in Chicago Mr. Grunsky attended the conference of engineering societies for the discussion of the Department of Public Works as delegate of the Society of Pacific Coast Consulting Engineers and was active in the formulation of the policies in favor of such a department passed by the convention.

D. W. Cole, manager of the Boise project, the largest irrigation project in the United States, has been succeeded by J. B. Bond of Klamath Falls, Ore., who was in charge of the Malheur project in Oregon and is a prominent reclamation service engineer. C. C. Fisher, assistant manager, has been assigned work on a new project and has severed his connection with the Boise project. C. E. MacClain, former water-master, has been made superintendent of irrigation.

Benjamin G. Lamme, chief engineer of the Westinghouse Electric Company, has been chosen to receive the Edison Medal at the annual meeting of the A. I. E. E. held on May 16, 1919, "for meritorious achievement in electrical science." In 1915 Mr. Lamme was, upon nomination by the American Institute of Electrical Engineers, appointed by the Secretary of the Navy to membership on the Naval Consulting Board, and his services as a member of the Board during the war have been of great value to the country.

Major John L. Retallack has been appointed by the government of British Columbia to be public utilities commissioner for the province under the new public utilities act. Major Retallack has just recently returned from overseas where he served as quartermaster of the 48th battalion and later as transport officer in the railway corps. He is a mining engineer and a member of the Canadian Mining Institute. His appointment follows the recent resignation of R. H. Gale, mayor of Vancouver, who had originally been appointed to the position by the lieutenant-governor.

OBITUARY

Hermann Schussler, for fifty years engineer of the Spring Valley Water Company, designer of many notable hydraulic works in the West and Hawaii, and one of the well known hydraulic experts of the United States, died of heart failure recently at his home in San Francisco. Mr. Schussler designed and constructed the entire system of works of the Spring Valley Company. In his private practice, which he carried on at the same time, he designed and constructed the Lagunitas dam for the Marin Water Company; a seven-mile inverted siphon for the Virginia City Water Company, the pioneer high-pressure line, and many other notable engineering feats in the West.

Meeting Notices for Electrical Men

(The historic Coronado convention was the main event of the past two weeks period. Closely following this came the gathering of Westinghouse Agent-Jobbers at Del Monte. In Chicago on April 23 the first step toward a National Department of Public Works was taken. Other meetings of local interest are further recorded below.—The Editor.)

Engineering Conference

A conference of engineering societies called by the Engineering Council met at Chicago, April 23 to 25, M. O. Leighton, chairman of the National Service Committee, presiding. The gathering was for the purpose of discussing the establishment of a national Department of Public Works and outlining a program for bringing this about.

The conference was attended by some seventy accredited delegates, seven members of the Engineering Council and two members of the National Service Committee. In addition to these, representatives of engineering organizations from all parts of the country and of the Architects and Chemists were present. All discussions were conducted with open doors.

The desirability of coordinating the engineering and related government activities in a single department was expressed by a large number of delegates from all sections of the country and from all branches of the profession. This sentiment was embodied in resolutions which were carried unanimously by the assemblage.

Following this the conference took up in turn the various bureaus, services and commissions in which engineering activities predominate or are notable, with a view to ascertaining the general consensus of opinion as to which should be placed in a Department of Public Works. A committee was charged with this consideration and on the second day made a report which was unanimously adopted after slight amendment.

In considering a proposed campaign of education to bring about the establishment of a Department of Public Works, several delegates who were in a position to speak authoritatively assured the Conference of the vigorous support of the various technical publications in the conducting of such a campaign.

A campaign committee was named, in addition to an executive committee and a committee to prepare the text of a bill.

After disposing of the main question, the Conference considered the functions of the Engineering Council and the relation which should be established between the Council and engineering organizations other than the four founder societies originally represented. The need for representation of all engineering organizations, whether national in scope or not, was referred to by most of the speakers on the subject. The desirability of concerted action by the profession was strongly emphasized, and the Conference was cited as an

illustration of the need of some sort of federation of engineering organizations.

Synchronous Club of Los Angeles

The annual "Synchronizing" of the Associate Members of the Synchronous Club, preceded by the annual banquet, was held on April 29th. Owing to the absence of Ex-President R. H. Cates, W. S. Houseworth took charge and stage-managed the entertainment.

The regular open meeting of the society, held on May 13, was addressed by J. A. Lighthipe, chief electrical engineer of the Southern California Edison Company. His subject was "Early Stages of Electrical Development."

San Francisco Section, A. I. E. E.

The latest meeting of the committee on Railway Electrification was held at the San Francisco Engineers' Club on May 14. The special subject of the meeting was a discussion of "The Scope of the Committee's Work."

Chamber of Commerce of the United States

The seventieth annual meeting of the Chamber of Commerce was held at St. Louis April 28 to May 1. The subjects taken up included the League of Nations; anti-trust legislation; foreign relations and foreign trade; the disposition and operation of the railroads; the merchant marine, and industrial production and distribution.

Oregon Association Electrical Contractors and Dealers

The regular meeting of District No. 1 was held on April 21. The following were unanimously elected to membership; Sellwood Electric Company, J. R. Davidson of

Portland and the Welch Electric Company of Salem.

Mr. Finnegan and Mr. Green plan to go to Salem to confer with state authorities on the subject of separate specifications for state electrical and plumbing work.

California Association of Electrical Contractors and Dealers
A meeting of the Executive Committee was held in San Francisco on March 10, President M. A. DeLew in the chair.

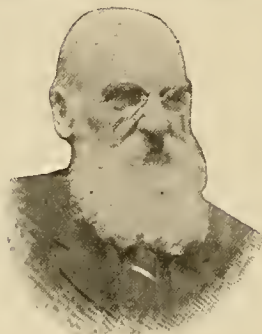
The following applications for membership were unanimously accepted: Werry, Palo Alto; Stanford Electric Works, Palo Alto; Knight and Miller, Modesto; Chas. Eyman, Madera; Bright Spot Electric Company, Stockton; E. S. Abbott, Tracy.

A motion was carried that subscriptions to the "Electrical Contractor-Dealer," "Electrical Merchandising" and the "Journal of Electricity" be taken out.

Monterey Bay Section, California Electrical Contractors and Dealers

The members of the California State Association, Monterey Bay Section, are arranging for a solicitation campaign,

BUILDERS OF THE WEST—LIII.



HENRY MORSE STEPHENS*

Not only in the classic halls of learning but in the business and professional life of the West has the life-work of Henry Morse Stephens, head of the history department at the University of California—friend and counsellor of the first magnitude—had a loving and profound influence over the lives of our citizens. As a mold of character, as a guide who pointed the way through the example of history to the better building of the future, he richly deserved the title of Builder. To Henry Morse Stephens, with loving memory, this issue is affectionately dedicated.

*It was with sincere regret that we learned that the sudden death of Prof. Stephens had prevented our paying him this tribute during his lifetime. Prof. Stephens had made an appointment to sit for his picture for this series just prior to the time when he was stricken with heart failure.



SOME OF THE PROMINENT PEOPLE AT THE CORONADO CONVENTIONS

Over five hundred men from all branches of the electrical industry attended the joint conventions of the California Association of Electrical Contractors and Dealers, Pacific Coast Division Electrical Supply Jobbers and Pacific Coast Section N. E. L. A. at Coronado. Seated in the front row, reading from left to right, are: H. F. Jackson, former president of the Pacific Coast Section, N. E. L. A.; J. B. Black of the papers committee, T. E. Bibbins, president of the Pacific Division, Electrical Supply Jobbers; Samuel Kahn, president of the Pacific Coast Section, N. E. L. A.; Henry Bostwick of the executive committee; A. E. Wishon, newly elected president and A. B. West, K. E. Van Kuran, H. L. Allen, Frank Somers and D. E. Harris, all of the executive committee, Pacific Coast Section N. E. L. A.; M. A. DeLew, president of the California Association of Electrical Contractors and Dealers; John A. Britton, chairman of the public policy committee; S. M. Kennedy, author of the "surprise" paper of the convention; L. S. Ready of the California Railroad Commission; H. H. Jones, chairman of convention, and W. L. Frost, chairman of the entertainment committee.

and it is anticipated several solicitors will be put out in the territory in the very near future. Close cooperation is enjoyed with the central station of the territory—the Coast Counties Gas and Electric—their genial local manager at Santa Cruz, Mr. Cardiff, giving his assurance of every support to help the work along. The electric range will be one of the home appliances to be featured.

At a most enthusiastically attended meeting of the Section recently held at Watsonville, at which the wives of the members attended, details of the campaign were finally decided upon, it being the purpose to cover Santa Cruz, Watsonville, Monterey, Hollister, Salinas and the intervening territory for a period of at least a year, by which time it is anticipated that the results obtained not only by direct sales, but through the publicity given to the uses and advantages of electrical appliances in the home will warrant the permanent continuance of the plan.

A. I. E. E., San Francisco

On May 23rd the San Francisco Section of the A. I. E. E. will visit Palo Alto and go through the factory of the Federal Telegraph Company. Dr. Leonard F. Fuller will give a talk at the factory entitled "Recent Developments in Long Distance Telegraphy—an Illustrated Description of the Stations Used in the Transatlantic, Transcontinental and Transpacific Radio-Circuit," with a demonstration of high voltage, high frequency phenomena.

The Del Monte Convention of Westinghouse Agent-Jobbers

The great convention comprising representatives of the Westinghouse agent-jobbers from all parts of the nation, as previously described in the columns of the Journal of Electricity on page 401, April 15, 1919, and on page 450, May 1, 1919, has been held. The convention was a complete success in every sense of the word. Not only were the papers of high order but the broad discussion on problems of vital interest to the industry as a whole as brought out at the Del Monte gathering will be reflected in all branches of the industry in raising the ideals of the industry to higher standards of attainment.

The splendid talks of W. C. Free on salesmanship, of T. Julian McGill on bettering the employe situation, of Walter Cary on laying the cards on the table, or in other words increasing the frankness of expression when putting up a business proposition even in the presence of competitors, and of W. L. Goodwin, founder of the well-known Goodwin Plan, will stand out in helpfulness for many months to come.

At the concluding session on Friday F. E. Stow, of Philadelphia, was elected to succeed J. C. Schmidtbauer as president of the Westinghouse Agent-Jobbers' Association, and

Hot Springs, Va., was chosen as the meeting place for the next annual gathering.

PACIFIC COAST SECTION, ELECTRICAL SUPPLY JOBBERS

The jobbers' sessions, held as part of the joint conventions at Coronado on the first two days of the week, included papers by D. C. Pence, Illinois Electric Company, on "Competition Based on Vindictiveness"; W. S. Berry, Western Electric Company, on "Service on Returned Goods," and H. L. Harper, Western Electric Company, on "Relations Between Contractor, Jobber and Manufacturer."

JOBBERS HAVE ANNUAL PLAY FOR GOLF CUPS

Tuesday afternoon the possession for the ensuing year of the highly valued golf trophies of the Electrical Supply Jobbers' Association was determined after many spirited contests. The much beloved Old Copper Cup and the Pass and Seymour Cup went to H. D. Randall of Salt Lake City. The Turner Trophy was captured by C. C. Hillis of San Francisco, and Frank Fagan of San Francisco won the honor of possession of the cup presented to the Jobbers by the Manufacturers. The presentations were made at the joint banquet of Jobbers and Manufacturers that evening, which was presided over by F. N. Averill.

HELPFUL SESSIONS OF THE CONTRACTOR-DEALERS

Considerable interest was centered in the Contractor-Dealer sessions of the convention. The past six months' work of the Association was reviewed in Executive Committee session held on Tuesday while at the Wednesday session the work of and results obtained from the California Co-operative Campaign efforts were considered. The testimony given by the dealers present was of a most enthusiastic and encouraging nature. It is hoped to enter upon still more extended efforts during the coming year.

Notwithstanding the fact that the convention this year is located at a considerable distance from a large number of the contractors and dealers of the state, yet the large representation of this branch of the electrical industry at the meeting testifies to the intense interest and earnestness with which the electrical contractor-dealer has entered into the new era of electrical development on the Pacific Coast.

UTAH SOCIETY OF ENGINEERS

The regular meeting of the Utah Society of Engineers was held April 23. Papers were presented on different phases of sugar refining, which is such an important industry in the inter-mountain country. The principal subjects were "Mechan-

ical Operation of Factory," "Process and Chemical Control," "Polariscope," "Design of Factory," "Agricultural Problems" and "Bi-Products."

Electric Luncheon

The Electric Section of the Chamber of Commerce held a luncheon at the Hotel Oakland on May 8th. The opening address was given by Arthur Halloran of the Journal of Electricity on "Practical Results of the Convention at Coronado." Other speakers of the occasion were Frank E. Boyd of the General Electric Company, Dave Harris of the Pacific States Electric Company, R. C. W. Libbey of Cambridge, Mass., and George N. Rooker of the Western States Gas & Electric Company, Richmond.

WESTERN MEETINGS

Home Industry League —

May 1—Joint conference-luncheon at Palace Hotel. Lewis F. Byington—"Support California."

National Electric Light Association, Portland Section —

May 6—George E. Quinan—"National Electric Safety Code."

Jovian Electric League, Los Angeles —

April 30—No meeting on account of the N. E. L. A. convention.

Foreign Trade Club —

April 23—Robert Sibley—"Foreign Trade from an Engineer's Viewpoint."

A. I. E. E., Seattle Section —

May 20—L. T. Merwin—"Novel Features of a High Pressure Steam Distribution System Recently Installed at Portland."

THE "NEW SPIRIT OF LIGHTING" AT THE N. E. L. A. CONVENTION

An interesting feature is being planned for the coming convention of the National Electric Light Association at Atlantic City for the purpose of expressing to the industry what has been called "The New Spirit of Lighting." Through the N. E. L. A. Lamp Committee with the cooperation of the Lighting Sales Bureau of the Commercial Section and lamp manufacturers, these more interesting aspects of modern lighting are to be presented in the form of a special exhibit to occupy a conspicuous position in the exhibition hall at the convention.

This special lighting exhibit will be composed of ten separate booths or sections, the outstanding features of which will be very elaborate presentations of industrial, store, window and home lighting. The industrial lighting exhibit, for instance, will be a typical modern machine shop with machinery representing several classes of industry installed and running. Illumination will be provided by three systems of lighting. One will show the too prevalent scale of poor lighting, another a good standard of illumination and a third will present what is considered the best productive intensity.

For the purpose of demonstrating the best modern standards of show-window illumination, a life-size show-window will be installed in which there will be a practical display of merchandise. It is expected that this display will be changed daily during the convention under the guidance of some prominent Atlantic City or Philadelphia department store. This show-window will be equipped with 15 different systems of show-window lighting, demonstrating different intensities of illumination from different directions.

There will be another space devoted to home lighting which will comprise a number of typical rooms, characteristic of a modern priced dwelling such as represents in large measure the home lighting problem of the day. These rooms will be illuminated by a very flexible system of lighting which will

enable the operator to demonstrate the advantages of different types of fixtures and different ideas in the arrangement and location of lighting outlets. There will be a variety of portable lamps in use, not as an exhibition of the lamps themselves, but merely incidental to the illumination.

Then there will be other sections given up to the display of indoor lighting equipment and outdoor lighting equipment. There will be a room devoted to the newer applications of lighting, such as the moving picture field and the use of projector lighting. There will be a room given up to central station lamp practice, illustrating the report of the lamp committee on the standardization of voltage, recent experience in the merchandising of lamps and other data showing what control stations are doing in the lighting field in different cities. In another section will be gathered together the educational literature available at present on lighting subjects. Here will be files giving a key to the different items of equipment featured in the different parts of the exhibition, standard and special equipment now in use in varying phases of lighting prospects and other general information.

The foyer of the lighting exhibit will be attractively furnished as a rest room and entirely illuminated by portable lamps. At the end of the foyer will be a moving picture screen where a large number of exceedingly interesting films, both on lighting and other electrical subjects, will be shown.

CALIFORNIA CONTRACTOR-DEALER NOTES

Gould the Light Man, at Stockton, Cal., has just moved into a finely equipped new store in the shopping district in Stockton.

E. B. Anderson, of Coalinga, Cal., has just moved into a fine retail establishment, and is opening a fully equipped retailing business.

Henry Fenneman, of the United Electric Company, at Taft, Cal., was a recent visitor to San Francisco.

Lawrence Scott, formerly with the Mt. Whitney Power Company, has recently bought a half interest in the Chaffee Electric Company at Visalia, Cal.

The Nutt Brothers, proprietors of the E. M. & M. Service, Lindsay and Exeter, were recent visitors at San Francisco in connection with matters affecting their new and progressive establishment at Lindsay.

R. E. Mixer, of the General Electric Company, San Francisco, is to leave that company, having accepted the position of manager for the Turner Electric Company, recently opened at Modesto, Cal.

E. E. Brown of San Francisco has entered the electrical contracting business for himself in that city. The new firm will be known as Brown & Langlais.

The Greeneps, of Hollister, have taken over a new store location which will be devoted exclusively to the electrical business, both contracting and retail, and will be conducted by Greenep, Jr., who has recently returned from the war.

The Los Banos Electric Shop has recently been opened at Los Banos, Cal. R. G. Murphy is the proprietor.

The Central States Electric Company at Fresno have recently expanded their place of business, taking in the store next door, which will be devoted to the selling of washing machines and vacuum cleaners.

The Noggle Electric Company, of Monterey, Cal., has entered the automobile field, having taken over the agency for the Nash car.

The Bright Spot Electric Company has recently entered the field in Stockton. W. A. Murphy and G. A. Marengo are the proprietors.

The Star Electric Company at Bakersfield, Cal., has recently moved from East Bakersfield into a very attractive location in Bakersfield proper.

The Sullivan Electric Company of Modesto has recently opened for business in an attractively equipped store.

HAPPENINGS IN THE INDUSTRY

ELECTRIC POWER IN JAPAN

The following figures concerning the electrical industry in Japan are returned by the Department of Communications: Number of power companies, 623; electric railways, 42; power and railway, 48; total, 713. These figures, which were compiled at the end of October, 1918, show an increase of 43 over those of September, 1917. The total working power is 1,073,445 kw.—an increase of 154,085 kw. over the preceding year.

ELECTRICAL DEVELOPMENT IN ENGLAND

A campaign similar to that conducted in the United States by the Society for Electrical Development is now being inaugurated by the British government, for the purpose of popularizing the use of electricity. The Society has been asked to furnish the British authorities with copies of its material.

CHICAGO ELECTRICAL SHOW

An Electrical Show and Exhibition called the "Chicago Electrical Show" will be conducted by the Electrical Trades Exhibition Company at the Coliseum, from October 11th to 25th inclusive. The exhibition, of which E. W. Lloyd is manager, is designed to stimulate electrical business by a display of appliances and apparatus. The last Show was held in 1911.

IDAHO ENGINEERS TO BE LICENSED

During its recent session the Idaho legislature passed House Bill 209 for licensing civil engineers. The act came into effect May 1, 1919, and provides for examination and registration of all applicants to practice civil engineering.

TRANSMISSION LINE TO CONNECT TWO ARIZONA SYSTEMS

A transmission line seventy miles long is to be constructed to connect the generating stations of the Pacific Gas & Electric Company of Phoenix, Arizona, and the Arizona Power Company of Prescott. G. H. Wallbridge is president of the Pacific Gas & Electric Company of Arizona, while the vice-president, F. S. Biele, is also president of the Arizona Power Company.

The demand for power in the district has increased, and it is expected that additional power facilities will hasten development. The Pacific Gas & Electric Company obtains its power chiefly through the Salt River Valley Water Users' Association from the Roosevelt Dam. A large additional supply of cheap power which is not obtainable from this source will be furnished by connection with the Arizona Power Company.

TRADE NOTES

Bellingham Coal Mine —

The Puget Sound Traction Light and Power Company at Bellingham, Wash., is extending a 6500 volt line from its main power line to the new Bellingham coal mine just beyond the city limits. The mine is the property of John C. Eden and associates of Seattle.

A power hoist is being erected, and an electric locomotive will be used for hauling and dumping the coal. It is understood also that as the mine is but a mile and a half from the water front and considerable pumping may be necessary, electric pumps will probably be installed to deal with the surplus water.

Moved to New Quarters —

The Electric Motor and Machine Company of San Francisco has recently moved to 407 Stockton street, where it has a duplex store, one side for merchandising of appliances and the other for motors and repairs.

Electrical Installations at Everett, Washington —

A five-way shipyard is being constructed at Everett, Washington, by the Norway Pacific Construction and Dry Dock Company, with electrical equipment which will give the company a connected load of 3000 kilowatts. The power is delivered by Stone and Webster.

A motor generator set is being installed for producing direct current to operate electric cranes in the shipyards. The wiring of all buildings was done in metal conduit providing for high-power tungsten lamps in buildings and yards, with special lighting for each individual machine.

Expansion Program —

Rathbone, Sard and Company, one of the oldest stove and range manufacturers of the country, have recently opened branch offices in San Francisco, Portland, Los Angeles and Salt Lake City. At each of these points warehouse service is maintained, and complete and ample stock carried ready for immediate shipment on dealers' orders.

The company is starting a vigorous selling campaign to increase its sales of electric ranges, especially in the coast and mountain states where low current rates prevail.

The organization in the West is directed by C. F. Jaques, district sales manager, who has his headquarters at the Portland branch and supervises the work of the other western branches. The San Francisco branch is in charge of M. S. Barnett, the Los Angeles branch of M. M. Merritt, and the Salt Lake City branch of M. C. Bennett.

Electrification in Southern Oregon —

The Buck box factory of Eugene, Oregon, is moving to Reedsport, and has contracted with the Marshfield Electric Company for some 100 horsepower motors to operate the new plant. The Marshfield company will also install an electric plant at Reedsport for the Reedsport Light and Power Company and will put in the distributing system.

The Johnson mill at Coquille is installing two 75 horsepower motors, and one smaller one, and the Oregon Export Lumber Company is putting in an electric hoist at the Southern Pacific docks. Julius Kruse is electrifying his ranch near Coos City, installing a motor to operate his milking machine and wiring his house and barns.

New Offices —

The Van Dorn & Dutton Company of Cleveland, Ohio, manufacturers of gears, have opened branch offices at New York and Chicago, where their purpose is to specialize in gears and pinions for electrical work. Harry F. Keegan will manage the Chicago branch, and his brother, John Keegan, the one at New York.

New Plant at Louisville —

The Ignition Plug Company of Dayton has located its plant in Louisville. The officers of the company are E. R. Stucky, president; H. C. Smith, vice-president; C. D. Rodman, vice-president; W. T. O'Neal, secretary and treasurer; A. C. Reager, assistant secretary. The company has representatives in the principal cities of Indiana, Illinois and Kentucky. It will manufacture a spark plug known as the "Tipco."

New Business —

The Standard Electric Company, 73 Horton street, Seattle, recently wired the auxiliary schooner Hamilton, built at the McAteer shipyards; the auxiliary schooner Snetind, built by the Price Shipbuilding Company near Ballard, and a large crane for the Puget Sound Machinery Depot.

Change of Address —

The Booth-Hall Company, designers and builders of electric furnaces, announce the removal of their executive and sales offices to Rooms 1007-1008, Hearst Building, 326 West Madison street, Chicago.

G-E Employees in Parade —

Thirty-one women employees of the General Electric Company offices in San Francisco took part in the Welcome Home parade on April 22, one girl for each of the thirty-one



stars in the company's service flag. The names of the boys were put in envelopes and the girls drew to see for which particular one each would march. The effective result as a feature of the parade is shown above.

Brazil Railway to Install Electric Furnace —

The Central Railway of Brazil reports its intention of installing in its workshops an electric furnace for the smelting of ferro-manganese.

New Company —

The China Electricity Company is a new concern being organized by the Sino-Japanese Industrial Company and the China Industrial Development Association to combine the Japanese firms in China dealing in electrical goods.

American Bank in the Orient —

The Asia Banking Corporation, the second American banking institution to be established in the Orient, opened its offices in Shanghai on February 7. The new bank will carry on business with an American staff.

New Connection —

Max Loewenthal, formerly manager of the appliance department of the Panama Lamp & Commercial Company, announces that he has severed his connection with that company and beginning with May 1, 1919, will conduct an organization under the name of the Globe Commercial Company, with offices at San Francisco. The new firm represents the "Menominee" Electrical Products, "Pittsburgh" Electric Specialties, "Russell" Hold Heat Appliances, "America" Vacuum Cleaners, "Haag" Washing Machines, "Domestic" Electric Steam Washers, "Ostrander" Sockets, Shades, etc., "Sadnard" National Line of Switches, "Empire" Bell and Toy Transformers, "Wells" Motor Starting Switches, "Globe" and "Waage" Electric Irons, "Red Top" Toasters and Iron Plugs, as well as automobile specialties, spotlights, timers, etc.

THE ELECTRICAL SUPPLY JOBBERS' PUBLICITY CAMPAIGN

An Open Letter from the Electrical Supply Jobbers' Association

At the meeting of the Electrical Supply Jobbers' Association held at Hot Springs, Va., May 22-23, 1918, a Publicity Committee was appointed to make an investigation of the means to be employed and the expense involved in conducting

a campaign of publicity, the purpose of which would be to set before the trade certain facts concerning the nature of the business and the purpose and work of the association.

The Publicity Committee, composed of A. M. Little, president of the Mohawk Electrical Supply Company, Syracuse, N. Y., chairman; F. R. Elliott, president of the Elliott-Lewis Electrical Company, Inc., Philadelphia, and F. D. Van Winkle, president of the Post-Glover Electric Company, Cincinnati, Ohio, presented its report at the Cleveland, Ohio, meeting of the Association, December 9, 10, 11, 1918, and an appropriation of \$12,000 was voted for the committee to continue its work.

Subsequently, arrangements were made to lay out a plan which includes the use of advertisements in electrical journals, reprints of these advertisements for mailing by the members of the Association, booklets describing the campaign for the use of members and members' salesmen, booklets for distribution to the trade, a prize contest for the best essay on jobber distribution, from the central station and contractor-dealer standpoint, with suitable and generous compensation for the winner, conference and correspondence with the editors of the electrical journals and an exchange of experience, ideas and suggestions with other associations in the industry, and with other associations of jobbers.

In connection with the use of the electrical journals it was decided to spend approximately \$8,000 for advertising space out of the total of \$12,000 available. The schedule includes a total of 108 pages of advertising in the papers selected, not less than 9 pages in any one month, as many as 13 pages in one month and including 6 double-page spreads.

The publicity campaign began in the March issues of the publications selected, and will be continued throughout the balance of the present year.

There has been some misapprehension regarding the purpose of the publicity campaign, especially with regard to the motives back of it, in connection with the relations of the jobber in general to other elements in the industry.

The publicity campaign is directed primarily to increase the use and consequently the sale of electrical apparatus and supplies. Anything that retards the rapid introduction and wide distribution of electrical goods holds back the industry. The business of the jobber has been evolved out of the necessities of both producer and buyer. On the part of the producer there is and has always been, since the electrical industry assumed national proportions, a need for means to speedily reach all points of possible demand and the assurance of business in such quantity as would stabilize production. On the part of the buyer there is and has always been a need for access to stocks near at hand in such combinations that no matter how numerous nor how few his requirements might be from day to day, his wants might always be supplied at short notice, and at low cost.

In the great growth of the industry, the function of the Jobber has never been displaced, and the trade channels which have been established through the necessities of the producer and buyer have never been diverted. While, on the one hand, the functioning of the Jobber has contributed thus to the rapid development of the industry, this very development has, on the other hand, brought about many problems of distribution which have made this Jobber function more and more a necessary factor, and constant study of all of the elements entering into such distribution have been made to keep even the balance between economy and expediency.

The purpose of the Electrical Supply Jobbers' Association is to study through associated efforts the factors underlying the most intelligent methods of doing business, and to make available for the individual the lessons taught by the aggregate experience of all of its members. The statistics, which the various committees of the Association are gathering are analyzed and business methods so adjusted as to keep

pace with the development of the electrical industry and the consequent increasing demand for Jobber representation.

This being the purpose of the Association, the purpose of the publicity campaign is to reveal to the trade definite information along these lines, so that every element interested, from producer to ultimate consumer, may understand clearly the advantages that all derive from a consistent adherence to a policy of Jobber distribution.

The Electric Light and Power Industry in the United States

According to a report about to be issued by Director Sam. L. Rogers, of the Bureau of the Census, Department of Commerce, the electric light and power stations in the United States during the year 1917 generated more than 25 billion kilowatt hours of electric energy, producing an income of more than a half billion dollars, and gave employment to more than 100,000 persons, whose salaries and wages aggregated nearly \$100,000,000. The output in 1917 was more than double that for 1912 and more than quadruple the output for 1907.

This report, which was prepared under the supervision of Eugene F. Hartley, Chief Statistician for Manufactures, covers both commercial and municipal plants, but does not cover electric plants operated by factories, hotels, etc., which generate current for their own consumption; plants that were idle or in course of construction.

The figures show great strides in the industry during both of the five-year periods 1907-12 and 1912-17. The output of electric energy by the light and power stations increased at a considerably greater rate, and their expenses at a slightly greater rate, than their income; and the rate of increase in the number of persons employed was much smaller, particularly during the later five-year period, than that in the amount of business done.

The total number of establishments increased from 5,221 in 1912 to 6,541 in 1917, the latter comprising 4,224 commercial establishments. The increase indicated by these figures is somewhat misleading, since 2,296 new establishments came into existence between 1912 and 1917, but as a result of combinations in the commercial systems and various other changes, the net increase was only 1,320, comprising 565 commercial and 755 municipal stations.

The total income of the stations in 1917, of which 95.3 per cent represented electric service, amounted to \$526,886,408, an increase of 74.3 per cent as compared with 1912 and of 200 per cent as compared with 1907. The total expenses were \$427,136,049, or 82.1 per cent more than in 1912 and 218.3 per cent more than in 1907. The employees of the light and power stations numbered 105,546, an increase of 33 per

In carrying out the publicity campaign no effort is intended to usurp the function of other elements in the industry, nor to divert to the Jobber any recognition other than that which a fair and honest evaluation of his services inspires. In the benefits that may accrue all elements in the industry—non-members as well as members of the Association—will participate.

cent over 1912 and of 121.6 per cent over 1907; and their salaries and wages aggregated \$95,239,954, an increase of 55.7 per cent as compared with 1912 and of 168.9 per cent over 1907.

The total primary power in 1917 amounted to 12,857,998 horsepower, an increase of 70.8 per cent as compared with 1912 and of 213.7 per cent over 1907. Of this power nearly two-thirds—8,389,389 horsepower—was derived from steam; almost one-third—4,251,423 horsepower—from water; and the remainder—217,186 horsepower, or less than 2 per cent—from internal-combustion engines. The corresponding proportions for 1912 and 1907 differed but slightly from those just stated. The average horsepower per steam engine shows a very great increase—from 334 in 1907 to 631 in 1912 and to 1,124 in 1917. The average horsepower of the water wheels also shows a marked increase from census to census, but in the case of the internal-combustion engines there has been a decline.

The total dynamo capacity, 9,001,872 kilowatts in 1917, represents an increase of 74.3 per cent as compared with 1912 and 232.2 per cent over 1907, these rates of increase being slightly greater than the corresponding ones for total primary power. The output of electrical energy aggregated 25,438,611,417 kilowatt hours, an increase of 119.9 per cent for the period 1912-1917 and of 339.9 per cent for the decade. Of the 6,541 establishments reported for 1917, those which purchased all their electric energy from other establishments numbered 1,422, as against 507 in 1912 and 227 in 1907.

The horsepower of stationary motors served amounted to 9,216,323 in 1917, or 123.1 per cent more than in 1912 and 458.9 per cent more than in 1907. The figures indicate that the arc lamp for street lighting is being fast superseded by the incandescent of various types. The former class of lamps decreased in number from 348,643 in 1912 to 256,838 in 1917, the reduction amounting to more than one-fourth, while during the same period the number of incandescent lamps more than doubled, increasing from 681,957 to 1,389,382.

The figures are shown in detail in the accompanying table.

ELECTRIC LIGHT AND POWER STATIONS: 1917
UNITED STATES

	1917	1912	1907	Per Cent of Increase			
				1907-1917	1912-1917	1907-1912	
Number of establishments.....	6,541	5,221	4,714	38.8	25.3	10.8	
Commercial	4,224	3,559	3,462	22.0	15.4	5.7	
Municipal	2,317	1,562	1,252	85.1	48.3	24.8	
Income	\$526,886,408	\$302,273,398	\$175,642,338	200.0	74.3	72.1	
Electric service	\$502,100,346	\$287,138,657	\$169,614,691	198.0	74.9	69.3	
All other	\$ 24,786,062	\$ 15,134,741	\$ 6,027,647	311.2	63.8	151.1	
Total expenses, including salaries and wages	\$427,136,049	\$234,577,277	\$134,196,911	218.3	82.1	74.8	
Number of persons employed.....	105,546	79,335	47,632	121.6	33.0	65.6	
Salaries and wages.....	\$ 95,239,954	\$ 61,161,941	\$ 35,420,324	168.9	55.7	72.7	
Total horsepower	12,857,998	7,530,044	4,098,188	213.7	70.8	83.7	
Steam engines:							
Number	7,464	7,847	8,054	— 7.3	— 4.9	— 2.6	
Horsepower	8,389,389	4,949,778	2,693,273	211.5	69.5	83.8	(1) A minus sign (—) denotes decrease.
Internal-combustion engines:							
Number	2,946	1,116	453	535.3	164.0	141.0	(2) Not available.
Horsepower	217,186	111,035	55,828	289.0	95.6	98.9	
Water wheels:							
Number	3,357	2,939	2,481	35.3	14.2	18.5	
Horsepower	4,251,423	2,469,231	1,349,087	215.1	72.2	83.0	
Kilowatt capacity of dynamos.....	9,001,872	5,165,439	2,709,225	232.2	74.3	90.7	
Output of stations, kilowatt hours.....	25,438,611,417	11,569,109,885	5,862,276,737	333.9	119.9	97.3	
Stationary motors served:							
Number	564,817	435,473	167,184	231.9	27.4	160.5	
Horsepower	9,216,323	4,130,619	1,649,026	458.9	123.1	150.6	
Number of street lamps:							
Arc	256,838	348,643	(2)	—	—25.3	—	
Incandescent, etc.	1,389,382	681,957	(2)	—	103.7	—	

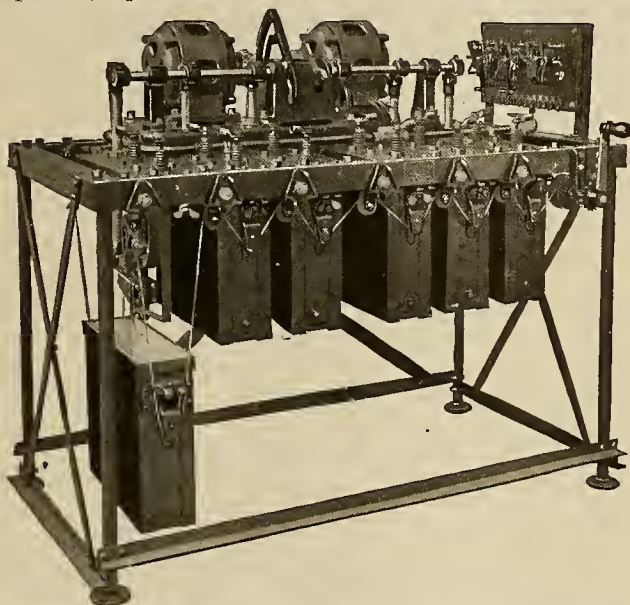
LATEST IN EVERYTHING ELECTRICAL

(A scientific dairy farm, equipped with numerous electric appliances, is described here, showing the extent to which electricity is being applied outside the towns. A new type of portable conveyor, an automatic farm lighting plant and other recent developments in the electrical world are also included in this series of notes.—The Editor.)

NEW OIL REVERSING SWITCH FOR LARGE MOTORS

High voltage slip ring motors built for steel mills, mine hoists and similar duty require some form of switch to connect the primary winding to the lines, especially so when the motor is used for reversing service. The accompanying illustration shows a new primary oil reverse switch that has several new and interesting features. It consists principally of two 3-pole switch units each operated by a high torque motor.

Among the unique features of this switch are the unit tank construction and the means of lowering the tanks for inspection, repairs and renewal of oil. Unit tank construction



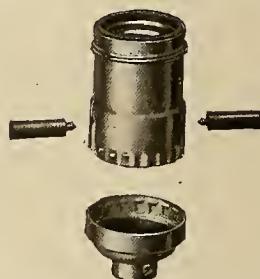
New Primary Oil Reversing Switch which is very quiet in operation, being operated by two high torque motors

is used because it increases accessibility and saves time and labor in locating trouble and making repairs. A double windlass with cables and pulleys permits easy lowering of one or more tanks. In the end view one of the tanks is lowered and shows the simple construction of the stationary and moving members. It will be noted that the arc is broken horizontally rather than vertically. This construction allows the arc to rise to the point of rupture without burning parts not designed for such duty; and since the rupture takes place near the top of the oil, it is well away from all sediment—hence frequent inspections and renewals are unnecessary. The support for the stationary and moving members is bolted to a channel iron which in turn is bolted to the main frame, consequently in case of serious damage to any single pole unit the complete unit may be removed without disturbing any of the others.

The contactor panel shown at the extreme right is controlled from a master switch or push buttons and handles the motor currents. Very little current is required as the motors used have high resistance rotors. This particular reversing switch was made by The Cutler-Hammer Manufacturing Company of Milwaukee for a 1200 h.p. 200 volt mine hoist motor. It may be used for two motors on non-reversing service, or where only one non-reversing motor is required the switch is made with only one 3-pole unit and one motor.

WRINKLET SOCKETS WITH DETACHABLE BUTTONS

The Bryant Electric Company of Bridgeport, Conn., manufacturers of the Wrinklet Interchangeable Line of Lamp



Socket and detachable button

Receptacles and Sockets, have improved their push button socket designated as List No. 81, by making both buttons detachable. This is accomplished by moulding a threaded stud laterally into each of the buttons, the stud in the black or "off" button being of a larger diameter and a different thread from the stud moulded in the red or "on" button. This feature prevents transposition of the two buttons after the socket has been inserted in the fixture. Sockets with detachable buttons are necessary for installation in husks, socket covers, and other restricted locations.

AUTOMATIC COMPENSATOR

An automatic compensator, put on the market by the Electric Controller & Manufacturing Company, has an operating magnet which is excited when the "start" button is pushed, and which closes the starting contacts for the motor, connecting the motor to a transformer for furnishing the starting voltage. As the motor speed increases, the current diminishes, and when the current has dropped to the right value, a transition relay allows the starting contacts to leave engagement and the running contacts to make engagement. This disconnects the motor from the transformer and the transformer from the line, and connects the motor to the line. When the "stop" button is pushed, the operating magnet is de-energized, the compensator falls to the "off," or "stop" position, and the motor stops. All of these operations, excepting pushing the "start" and "stop" buttons, are carried out automatically by the compensator itself.

An iron case with a removable cover contains the compensator, which operates submerged in oil. The case is dust-proof and weatherproof and all exposed parts are dead electrically.

FARM POWER AND LIGHTING PLANT

A lighting plant which is started automatically as soon as any light anywhere on the system is turned on has been put on the market by the Automatic Light Company. The turning on of light or power closes the circuit of the relay and this in turn closes the switch on the starting motor which starts the engine. When 90 volts are reached, the 6-volt current cuts out and the 110-volt cuts in. This operation reverses when the last light or power is turned off and the plant then stops.

The engine is the company's own design, single cylinder, four cycle, valve in head motor, water cooled by a special percolator system that requires only four gallons of water and that keeps the cylinder between 230 and 240 degrees F.

The only battery in the plant is a standard six-volt for starting.

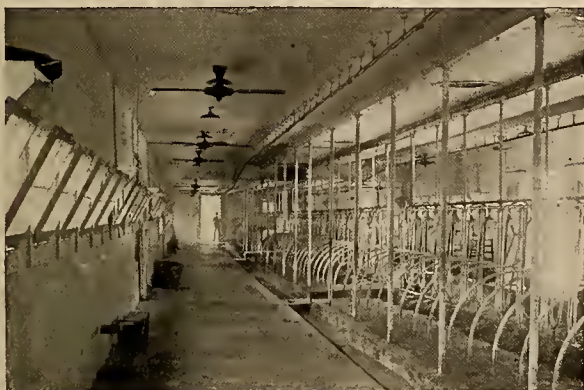
A novel feature is the voltage regulation. This is accomplished by an electric solenoid governor which acts directly on the throttle of the carburetor, opening and closing it to take care of the slightest variation in voltage, thus

producing a steady light direct from the generator and with high fuel economy.

SCIENTIFIC DAIRY FARM

Undoubtedly Briarcliff Dairy Farm, which is owned by Mr. A. D. Chandler of Atlanta, Georgia, is as modern and scientifically conducted as the most exacting customer would require. The barn is provided with concrete floors, wooden blocks, electric lights and fans, steel frame stalls, novel drinking fountains, milking machines, concrete feed troughs, electric equipment for the silo and bottling of milk.

The farm has a colony of 180 full-blooded registered Holstein cattle. Their value is based on their direct propor-



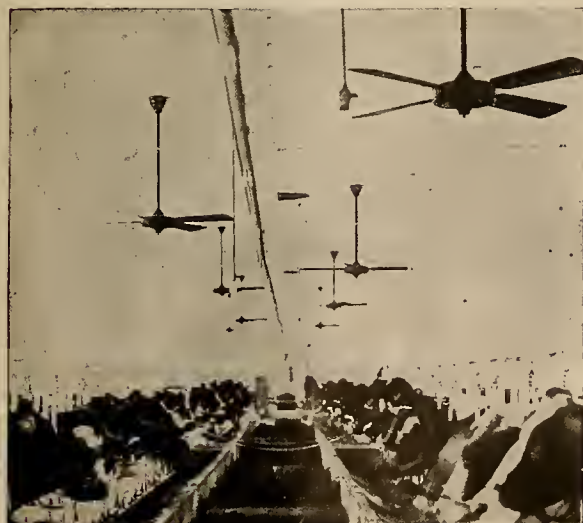
Modern stable of Briarcliff Dairy Farm of Atlanta, Georgia

tional response in milk to scientific feeding and careful housing.

The interior of the barn is shown in Figure 1. It is



Individual drinking fountain for the cattle



Stable showing double row of Holstein cattle and Westinghouse electric fans



Silo at Briarcliff Farm being filled by aid of Westinghouse motor

absolutely clean and looks it. Fresh air and sunlight are supplied in abundance by the numerous windows on each side equipped for easy adjustment. The floors, walls and ceiling are concrete and also spell cleanliness. Westinghouse ceiling fans are shown cooling the atmosphere in summer and ventilating in winter. The electric lights are also shown. The steel rails and stanchions are easy to keep clean and occupy a small amount of space.

Figure 2 shows the individual drinking fountains in the foreground. There is always a small amount of water in the bottom of the cement cup to entice the cow, for she is as dumb in regard to mechanics as fastidious about some other things. When she makes the attempt, unconsciously she forces the valve open and hence always has fresh water. The feed trough shown, facilitates handling hay ensilage and grain and makes scientific feeding possible.

The green corn for ensilage is cut with the aid of a type C. S. 15 h.p. motor, and is blown through a conveyor into the top of a forty-foot silo. Mr. Candler considers green corn ensilage as the next best thing to green grass as a milk producing food.

All of the milking is done with the Vacuum Milking Machine, thus preventing any dirt from getting into the milk. The milk flows into an air-tight bucket, is emptied into a larger can and carried to the milk house. Just as soon as the milk arrives at the milk house it is strained and passed over a cooler until it reaches the proper temperature. From here it passes to a bottle filling machine, where the bottle is automatically filled and sealed.



View of stable showing milking machine

Books and Bulletins

Fuel Facts

Fuel Facts, second edition (revised), published by the United States Fuel Administration December, 1918, is a booklet of 64 pages containing information for consumers and savers of fuel. This little work is very valuable in its suggestions looking toward the saving of fuel and the data on world production of coal, petroleum, and hydroelectric power (developed and undeveloped) will prove of timely service in power development in the West.

Principles of Combustion

"Principles of Combustion in the Steam Boiler Furnace" is a recent booklet, by Arthur D. Pratt. Its size is 6 by 9 in.; 114 pp.; tables, charts and diagrams; cloth binding. Published by The Babcock & Wilcox Company of New York City. Power plant owners are coming more and more to appreciate the necessity for intelligence in the boiler room—the reinforcing of experience in firing by a full knowledge of the theory of combustion. In this excellent booklet the author, who is assistant to the advisory engineer of The Babcock & Wilcox Company, sets forth in clear, concise form the fundamental principles involved in combustion. After establishing the theory, simple examples are worked that illustrate the principles involved and the formulas deduced. First the chemistry of combustion is discussed, followed by chapters on density, weight, volume of gases, heat of combustion, specific heat, air and combustion, and combustion formulas. The two concluding chapters on the computation of combustion data and the heat balance are excellent.

Platinum From Black Sand

Technical Paper 196, "Notes on the Black Sand Deposits of Southern Oregon and Northern California" has just been issued by the Bureau of Mines.

As a result of the unusual demand for platinum in the manufacture of materials needed in war, the Bureau of Mines, Department of the Interior, decided to investigate some of the more promising localities on the Pacific Coast where gold and platinum are known to be associated with such minerals as magnetite, chromite and ilmenite, with various siliceous minerals, the aggregate constituting what are commonly known as "black sands."

The results of the investigation may be summarized by the statement that in general the black-sand deposits are disappointing in both value and quantity; they rarely contain enough gold and platinum or occur in adequate quantity to be exploited at a profit.

Upbuilding the Industry

The testimony before the senate committee on interstate commerce and statements bearing on the return of the railroads of the United States to private management and operation and on remedial action to accompany such return as suggested by the Association of Railway Executives are gathered together in pamphlet form and published under the title of "Remedial Railroad Legislation—1919."

"Representation in Industry" is the subject of a little booklet by John D. Rockefeller, Jr., which deals with the relations of employer and employe.

Two pamphlets on customer ownership have been gotten out by Wm. H. Hodge, Manager of the Publicity Department of H. M. Bylesby & Company, showing the benefits to the companies and to the public, and advocating the plan as an "American solution" of the relations between the utility and the community. The titles of these booklets are "Customer Ownership" and "Rational Public Ownership."

The war time aspects of illumination as a means of defense of property are covered in an interesting report which was prepared for the U. S. Government by the committee on war service of the Illuminating Engineering Society, and is published as War Department Document No. 800 under the title "Protective Lighting."

Of Engineering Interest

"Typical Specifications for Bituminous Road Materials" by Prevost Hubbard and Charles S. Reeve, and "Drainage Methods and Foundations for County Roads" by E. W. James, Vernon M. Peirce and Chas. H. Moorfield, are the titles of bulletins Nos. 691 and 724 respectively of the U. S. Department of Agriculture. Both are illustrated with charts and half tones.

Bulletins Nos. 105 and 106 of the University of Illinois deal with "Hydraulic Experiments with Valves, Orifices, Hose, Nozzles and Orifice Buckets" which were conducted by Arthur N. Talbot, Fred B. Seely, Virgil R. Fleming and Melvin L. Enger, and a "Test of a Flat Slab Floor of the Western Newspaper Union Building" by Arthur N. Talbot and Harrison F. Gonnerman.

The flow of water through one and one-half inch pipe and valves is the subject of a paper by Frederick W. Greve, Jr., which has been published as Bulletin No. 1 by the Engineering Experiment Station at Purdue University.

A compact little booklet has been issued by the A. Lietz Company of San Francisco, manufacturers of engineering, mining, surveying and nautical instruments, giving data on solar events under the title of "Solar Ephemeris, 1919." The little handbook will prove most useful for surveyors and engineers.

Electrical Apparatus

A revised edition of the Westinghouse Catalogue 3-B listing instruments and relays has recently been issued by that company. Several new types of apparatus are included and wherever possible one type is described on one page, thus making it easy to locate what you are looking for.

The Smith-Serrell Company of New York has gotten out a bulletin on the Pintite Rigid Coupling for line shafts which is described as non-slipping, simple and safe.

"Circle T" Externally Operated Switches are described in Bulletin No. 2 of the Trumbull Electric Manufacturing Company which gives descriptions, illustrations and price quotations. A pocket edition of the same bulletin gives the same data in letter folder size convenient for general use.

Two bulletins have recently been received from the Roller Smith Company, "4" Imps," direct current ammeters and voltmeters for small switchboards, and "Industrial" Type Circuit Breakers of simple and rugged design.

"This Tells How the Other Fellow Did It" is the heading of an interesting folder issued by the Electric Controller & Manufacturing Company of Cleveland, Ohio, which describes a push button operated automatic compensator. Bulletin 1042-B gives more elaborate details of the E. C. & M. Automatic Compensator for A.C. Squirrel Cage Motors.

The following bulletins have been received from the Delta Star Electric Company of Chicago:

Bulletin No. 34—High Tension Outdoor Universal "Unit Type" Bus bar and Wiring Supports—a 48 page catalog attractively illustrated with details of size and price.

Bulletin No. 302—Three Phase Low Tension Equipment up to 600 volts.

Addenda Bulletin No. 31A—"Unit Type" Indoor Bus Supports. All are punched for binding.

General Electric Company bulletins recently sent out include:

125 and 250 volt D.C. Small Plant Standard Unit Panels—Bulletin 47050A.

CR 2940—Push Button Stations for use in the Control Circuits of all types of Magnetic Control.

CR 3100—Drum-type Controllers for Cranes, Hoists and Similar Service.

CR 3105—Drum-type Controllers for Use with D.C. Adjustable-speed Motors.

Magnetic Control for Machine Tools for D.C. Motors.

Bureau of Mines Publications

The following are among the publications received from the Bureau of Mines:

Abstracts of Current Decisions on Mines and Mining from May to December, 1918, Bulletin 174—from January to May, 1918, Bulletin 172, by J. W. Thompson.

Inflammability of Aluminum Dust—Technical Paper 152—by Alan Leighton.

Mining and Milling of Lead and Zinc Ores in the Missouri-Kansas-Oklahoma Zinc District—Bulletin 154—by Clarence A. Wright.

Methods of Shutting Off Water in Oil and Gas Wells—Bulletin 163—by F. B. Tough.

Bibliography of Petroleum and Allied Substances—Bulletin 149—by E. H. Burroughs.

Gold dredging in the United States—Bulletin 127—by Chas. Janin.

Innovations in the Metallurgy of Lead—Bulletin 157—by Dorsey A. Lyon and Oliver C. Ralston.

Rock Quarrying for Cement Manufacture—Bulletin 160—by Oliver Bowles.

Miners' Safety and Health Almanac for 1919—Miners' Circular 24—compiled by Dr. R. C. Williams.

Fume and other Losses in Condensing Quicksilver from Furnace Gases—Technical Paper 96—by L. H. Duschak and C. N. Schuette.

The Quick Determination of Incombustible Matter in Coal and Rock Dust Mixtures in Mines—Technical Paper 144—by A. C. Fieldner, W. A. Selvig and F. D. Osgood.

Method of Least Squares Applied to Estimating Errors in Coal Analysis—Technical Paper 171—by J. D. Davis and J. G. Fairchild.

Effects of Moisture on the Spontaneous Heating of Stored Coal—Technical Paper 172—by S. H. Katz and H. C. Porter.

Use of the Interferometer in Gas Analysis—Technical Paper 185—by Frank M. Seibert and Walter C. Harpster.

Central Station Heating—Its Economic Features with Reference to Community Service—Technical Paper 191—by John C. White.

Use of the Hydrogen-Volatile-Matter Ratio in Obtaining the Net Heating Value of American Coals—Technical Paper 197—by A. C. Fieldner and W. A. Selvig.

Sulphur Dioxide Method for Determining Copper Minerals in Partly Oxidized Ores—Technical Paper 198—by Charles E. Van Barneveld and Edmund S. Leaver.

Colloids and Flotation—Technical Paper 200—by Frederick G. Moses.

Labor Saving at Limestone Quarries—Technical Paper 203—by Oliver Bowles.

Economic Operation of Steam Turbo-Electric Stations—Technical Paper 204—by C. T. Hirshfeld and C. L. Karr.

Coke Oven Accidents in the United States—Technical Paper 206—by Albert H. Fay.

How to Improve the Hot-air Furnace—Technical Paper 208—by Charles Whiting Baker.

Accidents at Metallurgical Works in the United States—Technical Paper 215—by Albert H. Fay.

Saving Coal in Steam Power Plants—Technical Paper 217—Reprint of a bulletin of the U. S. Fuel Administration.

Review of the Manganese Situation—by C. M. Weld.

Preparation of Crucible Graphite—by George D. Dub.

Problems Involved in the Concentration and Utilization of Domestic Low-Grade Manganese Ore—by Edmund Newton.

Miscellaneous

A bulletin has been sent out by the Commercial and Industrial Museum of Montreal calling attention to their permanent exhibit of All Commodities of the World. Free space is offered to manufacturers to make their goods known in Canada.

"The Bulk Shipment of Grain from the Columbia River Basin" was featured by the Oregon Society of Engineers in an attractive publication representing No. 1 of Vol. 2 of the Society Journal.

A Reconstruction Program

The Institute of Electrical Contractors of New York publishes for private distribution an interesting little booklet by Sullivan W. Jones, entitled "A Reconstruction Program for the Building Industry." As a straightforward study of the problems of contractor and architect it will inevitably be appreciated by all who are concerned with building operations.

114 Proved Plans to Save a Busy Man's Time

Compiled by A. W. Shaw Company. Size $5\frac{1}{2} \times 8\frac{1}{2}$ in.; 160 pp.; 28 illustrations; cloth binding. Published by A. W. Shaw Company and for sale by the Technical Book Shop, San Francisco. Price \$4.50, given with an 18 months' subscription to System Magazine.

The short cuts which are the result of personal experience are of more value than the treatises of theorists, and in confining this volume to actual discoveries of practical business men, the compilers have succeeded in making it a really valuable handbook for those to whom time is money. It is clearly divided into brief sections, one for each plan, and carefully indexed for ready reference.

Logarithms of Hyperbolic Functions to Twelve Significant Figures

By Frederick E. Pernot and Baldwin M. Woods. Size $10\frac{1}{2} \times 7$ in.; 467 pages. Published by the University of California.

These exhaustive tables are a very timely and invaluable contribution to the engineering world. Their authors have already achieved no little distinction in the realm of mathematics, and this volume will add considerable weight to their reputation, besides supplying a very definite need.

VICTORY LOAN

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Vigor will finish the job
Vacations after this one
Verify your citizenship
Validate your promises
Volunteer—don't be forced
Value your honor—pay your bills
Vindicate you claim to patriotism
Voice your thanks for victory
Vote for your self respect
Vassals can wait to be forced—not you
Vim to the end—of course it takes money
Vessels to bring them back
Vital things still remain to be done
Vigilance is needed
Victory was their contribution
Vague patriotism pays no bills
Virtue meets its obligations
Very patriotic, weren't you? Well, are you?
Veterans don't quit during battle
Vanquishing the enemy was a job—pay for it
Verbal patriots can now prove themselves
Valor to the end from the boys—merely money from you
Varnishing patriotism with words wins no war
Vouch for your patriotism
Visit a war hospital—then do your part
Volleys of bonds to back the boys
Various excuses pay no bills
Visible support is what is needed
Venerate the victors—but support them, too
Venture a little on the war—it's won
Voyages home need to be paid for
Verdict rendered—it was your war

SUBSCRIBE!

SUBSCRIBE!

Don't Repudiate Our Victory!

VICTORY LOAN

WILL BRING THE BOYS HOME



VOICE your thanks for victory
ESSELS to bring them back
ITAL things still remain to be done
IGILANCE is needed
AGUE patriotism pays no bills
ALIDATE those promises
ERY patriotic, weren't you? Well, are you?
OLUNTEER—don't be forced
ETERANS don't quit during battle
ERBAL patriots can now prove themselves

The "V" slogans originated by the Journal of Electricity and run on each page of the April 1st number did good work for the Victory Loan campaign. Here are two instances in which they were reproduced, that on the left in the form of a poster in use by a precinct committee of Los Angeles, and one the right on a little blue card issued by the Levy Electric Company of San Francisco.

NEW ELECTRICAL DEVELOPMENTS

(Lighting plans constitute the bulk of the new developments in the Northwest, while the activities of the Pacific Central District are notable for several important power projects under way. The Southwest reports among other activities various irrigation plans of importance. The Inter-Mountain news reports improvements along several lines of electrical interest.—The Editor.)

THE PACIFIC NORTHWEST

REEDSPORT, ORE.—The Reedsport Power & Light Company has contracted with the Marshfield Electric Company for installation of a plant and distributing system here.

CLOVERDALE, B. C.—The British Columbia Electric Company is planning to extend its transmission lines to Surrey Centre to furnish electricity for lamps and motors there.

SEATTLE, WASH.—Appropriations aggregating \$36,709.86 for extensions and improvements in the city lighting system have been approved by the finance committee of the city council.

CHEHALIS, WASH.—At the special election held recently the proposal to grant the Washington-Idaho Light & Power Company of Clarkston a franchise to supply electricity in Chehalis was carried.

SEATTLE, WASH.—NePage-McKenny Company, Armour building, Seattle, was awarded a contract for installation of the electrical equipment in the \$24,000 building to be erected at Bremerton, Wash., by the Bremer estate.

SPOKANE, WASH.—The \$2,000,000 plant of the Spokane Heat, Light & Power Company, this city, has been sold for \$400,000 by Receiver Ludwig Kemper to F. C. Paine of the Union Trust Company and E. P. Twohy, an attorney.

BURNS LAKE, B. C.—Messrs. F. R. Keefe and Charles Wallace propose erecting a dam on the Stellace river, near Burns Lake, and using the power produced to operate a large mill, construction on which will be commenced very soon.

VANCOUVER, WASH.—Proceedings to establish an improvement district embracing Washington street, for the installation of cluster lights along the main thoroughfare leading from the Interstate bridge, were launched at the Commercial Club and unanimously endorsed.

DALLAS, ORE.—The Dallas division of the Mountain States Power Company during the week ended April 15 closed a contract with the Willamette Valley Lumber Company for an additional 80 horsepower in motors, covering requirements of the new box factory to be erected at once.

SQUAMISH, B. C.—A contract has been awarded by the provincial government of British Columbia for the construction of a hydroelectric plant at Squamish to Robertson & Partners, Metropolitan Building, Vancouver, B. C., to cost about \$72,000. The plant will supply electricity for the railway shops and other industries in Squamish.

VANCOUVER, WASH.—At a recent meeting of the Better Government League a decision was made to begin a campaign at once through the different civic organizations for construction of a hydroelectric power plant to supply light, heat and power for lower Columbia basin residents at cost. It is the intention to have the government construct and own the plant.

SEATTLE, WASH.—A contract amounting to approximately \$100,000 was awarded to the Pacific Lamp & Supply Company by the Board of Public Works at its regular weekly meeting. The contract calls for the furnishing of the city with incandescent light bulbs for the ensuing year. To Seattle Hardware Company a contract was awarded for supplying certain pipe at a cost of \$4210.

SEATTLE, WASH.—The estimated cost of operating the Seattle municipal railway in May will be \$362,645, according to Superintendent

Thomas J. Murphine. The total is about \$60,000 more than the April estimate. The difference includes an increase in the transportation department, due, it is said, to the operation of more cars and the expense of making improvements in the property.

SEATTLE, WASH.—The sum of \$520,000 of street railway utility bonds for various extensions and betterments is proposed in a bill introduced in council. Among the improvements proposed will be the double tracking of the Fauntleroy line on Avalon Way, connection of Lake Union with the Madrona lines at 34th avenue, and extension of lines on the south approach to Ballard bridge.

BELLINGHAM, WASH.—A power and light company has been formed by the employees of the power company at Bellingham. It is building a transmission line into the town of Ferndale, Washington, with a view to supplying power and light to that community. The chief user of power at Ferndale will be the milk condenser. The manager of the company which is constructing this line is R. U. Muffley, superintendent of power and light for the Puget Sound Traction Light & Power Company at Bellingham.

THE PACIFIC CENTRAL DISTRICT

ORLAND, CAL.—The installation of an ornamental lighting system in the business district is under consideration.

WOODLAND, CAL.—It was announced here that a complete reorganization of the financial affairs of the Yolo Water and Power Company has been effected.

VALLEJO, CAL.—It was reported here that plans are already under way for the rebuilding of the plant of the Contra Costa Gas Company which was destroyed by fire recently.

RICHMOND, CAL.—Recently the electrical dealers of Richmond conducted an electric range campaign which resulted in the sale of 15 electric ranges and three electric water heaters and produced a large additional list of prospects, many of whom will purchase later.

OAKLAND, CAL.—Superior Judge Brown denied the motion of the Great Western Company for retrial of the suit in which the city of Oakland secured judgment for \$90,000 against the company. The money represents delinquencies in the payment for the electric lighting franchise.

FRESNO, CAL.—The Modesto and Turlock irrigation districts are about to launch a project for the building of a dam to cost \$3,000,000 on the Tuolumne river a few miles above the present La Grange dam, which now impounds the water of the Tuolumne river for use of the districts.

SACRAMENTO, CAL.—Commissioner of Public Works Thomas Coulter presented to the city commission an ordinance granting to the Pacific Gas and Electric Company a franchise to operate its jitneys on the loop connecting its J and M street car lines with a portion of East Sacramento.

BUTTE CITY, CAL.—Three of the big 26-inch pumps at the Sidds Landing plant of the Princeton-Codora-Glenn Irrigation District have been started, and an ample supply of water for rice and all other crops is being delivered. The three 26-inch pumps at the Princeton plant will be started in a few days.

EUREKA, CAL.—Another boat was launched recently by the Rolph Shipyards and plans are under way to lay the keel for another. The shipyards are contemplating installation of 100 horsepower in motors for the operation of fire protection apparatus. Current will be supplied by the Western States Gas & Electric Company.

FRESNO, CAL.—The California Packing Corporation of Fresno is planning to erect an electric power plant in connection with its new factories. The proposed plant will be equipped with mechanical and electrical equipment, including automatic machinery for handling and packing. Philip Bush, 101 California street, San Francisco, is engineer.

CHICO, CAL.—For the purpose of studying electric lighting systems over the state, with the object of taking over the local distribution system, City Trustees O. E. Tracy, Martin Polk and City Clerk Ira Morrison are making a tour of California cities owning their own distribution systems. The newly elected board of trustees is strongly in favor of municipal ownership of public utilities.

GREENVILLE, CAL.—Several officials of the Great Western Power Company, including President Fleishhacker and Superintendent Beardsley, are making a tour of inspection of the company's holdings in this vicinity. After a visit at Lake Almanor, the company's storage reservoir, they will proceed into Butt Valley, where a new power plant is to be built at an expenditure of \$7,500,000.

TULARE, CAL.—A series of fires, believed to have been due to insulators which were damaged during a recent rain storm, destroyed poles carrying the high tension wires of the Mt. Whitney Power and Electric Company over a stretch of the service system between here and Delano, a distance of nearly thirty miles. The service of the Tulare water system was interrupted for over three hours.

SAN FRANCISCO, CAL.—Surveys are being made for a dam site on Pit river above Copper City in connection with the proposed hydroelectric development by the Pit River Power Company. The plans provide for two power developments to cost about \$17,500,000. The first dam will be located near Sheep Rocks, 4 miles from Copper City, and the second dam is to be 12 miles up the river near the mouth of Totem creek.

OROVILLE, CAL.—Scores of landowners attended the Honcut conference on the organization of an irrigation district. The sentiment was favorable to the project, but difference of opinion as to the proper boundaries caused the appointment of a committee to take charge of the project. The committee includes E. Abbey, H. S. Munson, E. Biggs, H. H. Armstrong and C. M. Hill. The proposed district will include approximately 3700 acres in Butte and Yuba counties.

CHICO, CAL.—The irrigation project of the Phelan and Parrott ranches which has been under construction for the past two months is rapidly nearing completion and the engineers in charge of the project plan to have water running through the ditches by the last of this week. More than a mile of 60-inch redwood pipe and the same amount of 48-inch pipe has been laid from the pumping station. Five of the 20-inch centrifugal pumps have been installed and will shortly be in operation.

RED BLUFF, CAL.—The formation of an irrigation district under the California Wright Act is to be started at once. This plan was decided upon as a step toward furthering the interests of the Iron Canyon Project, at a joint meeting of the members of the Red Bluff and Corning Chambers of Commerce. By joint co-operation the Corning body will secure the signatures of land owners south of Thomas Creek and the local organization will sign up those to the northward. When all land owners have been signed up there will be a meeting held to perfect organization.

FRESNO, CAL.—Work has begun on the \$2,500,000 power plant on the San Joaquin River a half mile above Big Sandy, near Auberry, according to a statement made by the San Joaquin Light and Power Corporation. Roads are being built for the conveyance of material; a start has been made on the tunnel which taps the river six miles above the site of the power plant. A dam is also being built on the river at the entrance to the tunnel. The tunnel was chosen for feeding the power house because by its use a vertical fall of 400 feet can be given the water.

SACRAMENTO, CAL.—The Northern California Power Company, which in addition to selling energy to the Pacific Gas and Electric Company, serves the north end of the Sacramento Valley, was given authority by the State Railroad Commission recently to add a surcharge of 10 per cent to its rates. The surcharge will not apply to competitive territory in Butte and Colusa counties. The Commission in its decision held that 1919 expenses of the company will be increased over those of 1918, and that with the surcharge the company will make about 6.63 per cent upon its estimated capital of \$8,116,007 for this year.

WILLOWS, CAL.—Endorsement and support for the Iron Canyon project is pledged in a resolution unanimously adopted here by the Willows Chamber of Commerce, and William Durbrow, president of the Farm center, was authorized to name a Chamber of Commerce committee to devise ways and means to form a Wright Act irrigation district in this county in furtherance of the project. It is planned that approximately 100,000 acres of Glenn county lands shall be embraced in the district formed here. This will be the second district in the project in which steps have been taken toward organization.

EUREKA, CAL.—The first step in what is to lead to the completion of the Klamath Falls Municipal Railroad to Sprague river, was taken when the city council passed a resolution waiving the terms of payment under the contract with Robert E. Strahorn. The meaning of this resolution, stripped of all legal persiflage, is that the city anticipates an action that would have to be taken about July 1, or whenever Strahorn completes the line to Dairy. There is still a balance of \$16,770.13 remaining of the \$300,000 that the city was to pay for building the line to Dairy. This money has been turned over to Strahorn.

BAKERSFIELD, CAL.—The executive committee of the new irrigation project for the purpose of getting water to not less than 300,000 acres of desert land in Fremont Valley and Indian Wells, met in the Lankershim Hotel in Los Angeles and reports were made by members who had carried on investigations as requested. From the available information at hand it appeared possible that by cooperation with the various interests already vested in the water sheds in Kern and Inyo counties sufficient water could be conserved to irrigate in the two counties the semi-arid lands to the extent of not less than 300,000 acres. A committee was appointed to gather additional information.

FRESNO, CAL.—Plans will be completed within sixty days and construction will start

early in the fall on the new substation and shops of the San Joaquin Light & Power Corporation at a location on the west side of the Southern Pacific extending from Divisadero to Belmont streets, which will substitute the present substation at Fresno and N streets. This announcement was made by General Manager A. G. Wishon. He added that a general office building, erected along the most modern lines, may ultimately be built adjoining it. The proposed new substation will include a general repair shop, a garage where repairs will be done on most of the company's 200 cars and trucks now in service, a large store-room, a paint shop, and offices for the general shop and the store-room.

THE PACIFIC SOUTHWEST

POMONA, CAL.—The Southern Counties Gas Company will make an extension to their main on Central avenue from Holt to Eighth.

LOS ANGELES, CAL.—A permit has been granted to the Clune Production Company for the erection of a power plant.

ALBUQUERQUE, N. M.—The Chamber of Commerce is working hard to raise subscriptions towards the extension of the electric car line on Fourth street.

LOS ANGELES, CAL.—The Government proposes to construct a dam in Gila river 10 miles above Florence for the storage of water for the irrigation of 70,000 acres of land.

LOS ANGELES, CAL.—The installation of an ornamental lighting system on Westmoreland Place between Seventh street and Wilshire Boulevard has been authorized by the city council.

SANTA FE, N. M.—The council has appointed a committee to call on the Water & Light Company with reference to purchasing its plant, and to name an engineer for appraising the plant.

CALEXICO, CAL.—The trustees have passed an ordinance calling for an election May 27, 1919, to vote on bonds; \$165,000 for a municipal gas plant and \$160,000 for a municipal light plant.

RIVERSIDE, CAL.—Lynch & Lynch, civil engineers of Los Angeles, have been employed to make plans and specifications for the Beaumont irrigation district. Work on the ditches is to begin at once.

CHINO, CAL.—Application has been made to the Board of Trustees by the Southern Counties Gas Company for a franchise to lay and maintain a pipe line, etc., through the streets of the city for the distributing of gas for heat, light, etc.

GALLUP, N. M.—The Gallup Electric Light & Power Company, recently incorporated, will take over the electric light and power plant owned by Gregory and associates. The plant, it is understood, will be enlarged and the service improved.

LOS ANGELES, CAL.—If the deal can be completed within the next week or so for the purchase of the Edison system, there is a possibility that the purchase proposition and necessary power bond issue will be submitted to the voters before July 1.

BENSON, ARIZ.—About 10,000 new acres of land are to be irrigated by the Benson Canal Company. Plans made by R. V. Leeson of Kansas City for a diversion dam and head works on the San Pedro river have been accepted. The irrigated area is to be on the east side of the stream. The cost is about \$18,000.

BRAWLEY, CAL.—The Board of City Trustees has engaged the Olmstead & Gillien Company, engineers, Los Angeles, to prepare plans and supervise the construction of the proposed municipal electric light plant. It is proposed

to install two units of 250 kw. each. The minimum cost is placed at \$116,000.

LOS ANGELES, CAL.—Application has been made to the Board of Supervisors for a franchise granting the right to construct along and across certain highways, in certain districts of Los Angeles county, a pipe line system for not more than two pipe lines for the transportation and distribution of mineral oil, and to construct a telephone system in connection therewith.

RIVERSIDE, CAL.—H. N. Siegfried, commercial agent of the Nevada-California Power Company, stationed at Riverside, Cal., has just completed a report to F. Mechling, Nevada manager, on the cost of installing a power line to supply the Simon Lead Mining Company, 20 miles east of Mina. The report will form a basis for a decision when the officers of the respective companies get together.

SANTA FE, N. M.—The Arroyo Honda irrigation project four miles south of here will go forward. Engineer James A. French has gone over the ground and will install a new dam above the old one, and between it and the big storage dam, which will be raised 10 to 30 feet. It is planned to make a 2000 acre project, including a concrete storage basin below the dam. The South Santa Fe Land & Development Company has the project in hand.

THE INTER-MOUNTAIN DISTRICT

SALT LAKE CITY, UTAH.—Improvements to the waterworks supply lines, power plants, etc., to cost about \$1,000,000, are contemplated by the city council.

CEDAR CITY, UTAH.—The city council is negotiating with the Dixie Power Company to remove its electric poles from the main street into the block centers.

SALT LAKE CITY, UTAH.—Utah Power and Light Company, including the Western Power Company, reports for March gross earnings of \$458,258, a gain of \$14,568, or 3 per cent.

DILLON, MONT.—Plans are under consideration for the installation of a new street-lighting system and paving the streets. The cost of the entire work is estimated at about \$80,000.

ST. GEORGE, UTAH.—Dixie Power Company is making plans to build additional plants to take care of rapidly growing demands for power in territory which they serve in southern Utah.

GRACE, IDAHO.—Election held on the bond issue to purchase the Grace Lighting System carried with an overwhelming vote. The bond issue was for \$15,000, which will pay for the lighting system and leave enough surplus to make the system first-class in every respect.

SALT LAKE CITY, UTAH.—A group of local capitalists have made application to the State Engineer for 100 cubic feet of water from Logan River, in Cache county, for the irrigation of a tract of land containing 9,440 acres. It is the intention of the syndicate to spend approximately \$100,000 on an electrically operated pumping plant.

SALT LAKE CITY, UTAH.—Testimony is being taken by the Utah Public Utilities Commission in connection with the application for increased rates, freight and passenger, by the Bamberger Electric Railroad Company. The company is asking for sufficient increase to make their rates conform to the schedule applying to federal controlled roads.

SALT LAKE CITY, UTAH.—The Blue Creek Irrigation Company, by Roy Bullen of Logan, has filed application with the state engineer for permission to increase the height of its existing dam on Blue Creek in Boxelder county, 8 feet. D. O. Shurtz and J. R. Shurtz of Escalante are each asking for a second foot of water from Pine Creek, in Garfield county, to irrigate holdings of 80 and 65 acres respectively.

THE VACUUM CLEANER

THE VACUUM CLEANER

IT IS THE LARGE STREAM which is harnessed for water power, but you will note that the brook receives most of the poet's praise—and there have been those who found their perfect pleasure in contemplation of a raindrop. It is not the size, nor even serious purpose of the literary gem which gives it value. Similarly there are many small items which come into the life of an editorial room which, although not powerful rivers, yet have their value as has the brook, the spring—or even the cloudburst. The office vacuum cleaner collects these items and is here permitted to present them in an array which, although it sounds damp, is by no means tearful.—The Editor.



Korean Money may look different from American, but except for the occasional intelligibility of the hieroglyphics it may be transmitted through the mails much as our own. Here is a Korean money order sent in payment for a year's subscription to the Journal of Electricity from Unsan, Chosen:

日本郵政省
Department of Communications
of the Empire of Japan.

外国郵便為替金受領證書
RECEIPT for the amount of a FOREIGN MONEY ORDER.

22
No. of Order

ト記金額郵便為替金に依り送達ノ為受領シタリ
Received for transmission by Money Order the sum of

4 Yen 6 Sen

為替金額(外国貨等ニテ) Amount of Order (in foreign money)	郵便為替金額 Amount converted into Japanese money	換算割合 Rate of conversion	金 For.
245.00	4.96	1.941269	1.0
手数料 Freight			1.0
郵便運賃 Postage			1.0
郵便税 Postage tax			1.0
合計 Total			1.0

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San Francisco Calif. U. S. A.

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Name: C. W. Peterson

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Address: 1600 E. 1st Avenue
Unsan, Chosen, U. S. A.

振出局所主幹者
Postmaster

A Good One is what the Trumbull Safety Bulletin calls this pun which they credit to G. S. Martin of the supply department of the Canadian General Electric Company at Toronto.

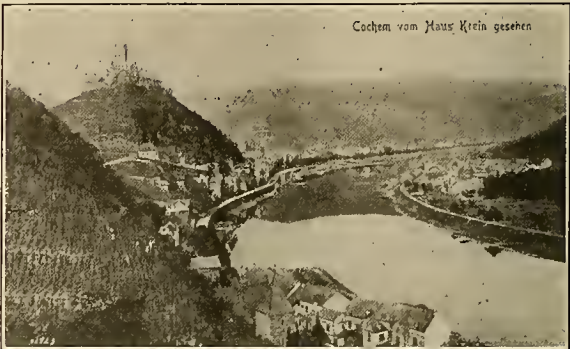
To win you have got to be
A 'Good Win'
And Plan to Win Good
Or be a 'Wooden One.'
A good plan to Win
Is to bring the Goodwin Plan in.
If you don't see the point—get a pin.
I'm all in."

They Do Things in a Big Way in the Army, even to the telling of yarns. A new use for construction equipment has been "invented" by an ingenious doughboy now with an engineer regiment in France, according to Engineering and Contracting. Writing to his home town newspaper he describes the army kitchen as follows:

The building is 928 ft. long and 300 ft. wide and its takes 18 firemen to keep it warm enough to work in. We have 579

cooks and 700 on kitchen police duty. We mash our potatoes with a piledriver and grind our coffee with a 350 h.p. Liberty motor. Our empty pans are hauled out on railroad trains. The kitchen police go around on roller skates. The mess sergeant rides around on a motorcycle shouting orders through a megaphone. Now for flapjacks, we mix the batter with 12 concrete mixers. We also have steam shovels moving egg shells away from the door and six kitchen police with bacon rinds strapped on their feet keep the griddles greased.

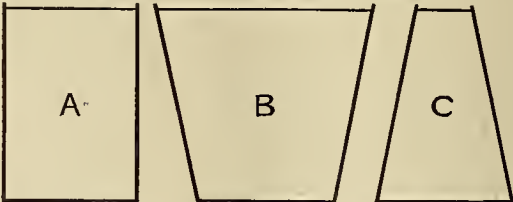
The "Made in Germany" mark was discovered by Capt. R. W. A. Brewer on some postcards for sale in San Francisco shops the other day, according to a recent item in the newspaper. They were being innocently sent overseas to the boys. This same little mark is found on many of the postcards which the boys are sending home—but it is received with



no such disfavor. Here is a "Made in Germany" card, for instance, which was sent from the Rhine by Paul H. Manchester, formerly connected with the P. G. & E. Co. of San Francisco, who has recently returned from overseas to be mustered out in this country. This gives an idea of where our troopers were located in Germany. The fine old castle, built probably in the 15th century, was staff quarters. Modern conveniences in the old structures are rare and the Americans were not satisfied until they hauled a generator set to the top of the hill with a small tank and had installed electric lights—the first on the hill. Illuminated crosses were placed on the peak at Christmas time and kept lighted all night long, even though it necessitated the maintaining of night shifts for the job.

ENGINEERS OF YESTERDAY—9. PASCAL

(A Series Compiled by A. L. Jordan)



If three tanks A, B and C have equal bases, is the pressure (lbs. per sq. in.) the same on each base; and in spite of the fact that the weight of water is greatest in B and least in C, is the total force on the bottom the same?

Blaise Pascal (b. in Auvergne, France, in 1623) showed that the pressure is the same (since that depends only upon the depth and the kind of liquid) and therefore the total force (pressure times area) is the same. The fact that this force is independent of the shape of the vessel, which he also proved by experiment, is called the "hydrostatic paradox." He was a well known mathematician at an early age but his greatest practical discovery was that of the hydraulic press, in 1653. It was announced in these words: "A vessel full of water is a new principle of mechanics and a new machine for multiplying forces to any degree we choose."

SAN FRANCISCO
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JOURNAL OF ELECTRICITY

VOL. 42. NO. 11

SAN FRANCISCO, JUNE 1, 1919

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of a thing,
but
the mark of a service



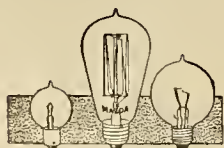
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scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this service.

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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

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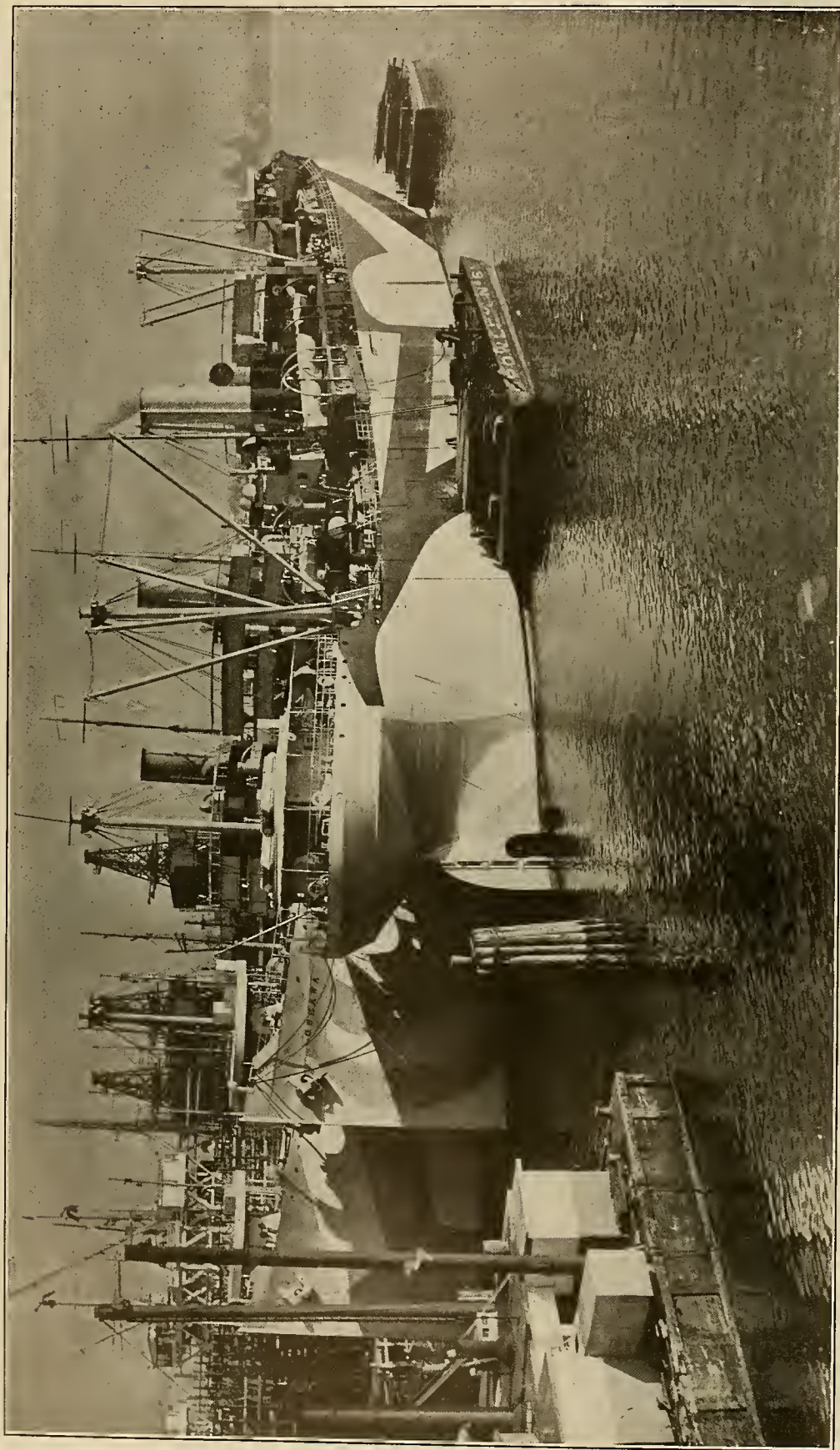
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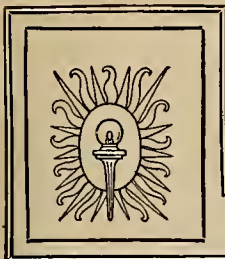
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A United States merchant marine on the Pacific is now an accomplished fact. Thousands of tons of ocean ships, each fitted out with electric lighting systems, searchlights, interconnecting telephones and wireless apparatus, have been sent out by Western ship yards. This steady construction has not been checked by the end of the war. A recent report from allied and neutral countries shows that of 7,796,266 tons under construction at the end of March, the United States was constructing over 4 million tons, while Great Britain was second with 2,254,845. The motor ship with electricity for its auxiliary service is already a factor in this construction and such achievements as the electrically propelled "New Mexico" point the way to the electric ship as the vessel of the future. The giant "California" now building at Mare Island, California, a sister ship to the "New Mexico," gives added interest to the method electrical in the West.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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Thrift is Never Idleness The idle dollar represents as concrete a waste as the dollar misspent. A hoarding of capital is the first sign of hard times. In these days of cautious buying with a tendency toward waiting for the price to drop on the part of the public, let us preach this doctrine. Prices are not going down. With a world waiting for our products, prosperity is ahead. Set the ball rolling for a cheerful optimism and the thrifty use of all our resources. **BUY NOW!**

A great advance in harmonizing the various activities engaged in merchandising electrical ware has been made in the West. One

A Plea for the Open Meeting

branch of the industry—the electrical contractors and dealers—in one of the most prominent of its local sections has decided in favor of the open meeting.

Broad visioned men of the day recognize that in the merchandising of electrical ware it is wrong and unethical to attempt to control the channels through which manufactured products reach the trade. Accurate cost accounting methods alone will demonstrate the superiority of whatever channel ultimately shall win permanence in its service to the industry.

It is to be hoped that other branches of the industry will view this problem with the same broad vision and throw open the doors, and thus display to their co-workers and to the public at large that confidence is to be acquired only by the most open discussion—a discussion that savors so of a desire to serve the industry and the public at large that there is nothing to conceal.

The past month has seen a decided advance forward in the cooperative idea throughout the West.

The Spread of the

Cooperative Idea

And it must be admitted that the presence of such men as W. L. Goodwin, of the General Electric Company, founder of the well-known "Goodwin Plan," and of Samuel Adams Chase, a member of the supply staff of the Westinghouse Electric and Manufacturing Company, has done much to forward this work. The West has always claimed Mr. Goodwin, who is a native of this section of our country, as one of its most effective exponents in forwarding helpful and constructive ideals. The presence of Mr. Chase, representing a second of our largest electrical manufacturing concerns, appearing simultaneously with Mr. Goodwin and ably backing up the gospel Mr. Goodwin is preaching, adds a distinct tone of breadth of vision to modern expansion

in ideals of merchandising electrical ware that have already advanced to such wonderful heights of co-operative helpfulness in the West.

This ideal was again put into further practical application by the broad manner in which the Westinghouse Agent Jobbers' national convention was conducted at Del Monte. Not only were papers of exceptionally high value to the industry presented but the broad vision with which guests were invited to be present at and take part in the discussion is especially to be commended. The West has learned much in recent months from this contact with men and organizations of national scope meeting in our midst, and we trust in return we have imparted to our visitors something of our enthusiasm and newness of life that actuates our great industry in this section of our nation.

Considerable discussion has gone the rounds of late in the matter of electrical inspectors for the

The Need for Electrical Inspectors

U. S. Shipping Board. The splendid paper appearing elsewhere in this issue by a prominent electrical inspector for the U. S. Shipping Board on the Pacific Coast speaks too clearly the high ideals of service that are being held in view by these men to need further comment here. If one desires further evidence of the excellent work being performed, a most direct way to find complete satisfaction is to go aboard on one of the numerous trial trips that are almost of daily occurrence and see for oneself the high standards of efficiency that are there attained.

And this brings us to the subject of local inspection in some of the larger cities of the West. The Budget Committee of city officials in some instances are trying to cut down on the number of electrical inspectors where the demands of the hour indicate the reverse policy should be put into practice. All branches of the industry should exert their influence in San Francisco and other cities of the West to see to it that false economy of this nature should not be tolerated.

It is said that there are 30,000 families in New York searching for homes. Certainly it is familiar to all of us that hotels the country over are over-crowded, the visitor in even the smaller interior cities of the West learning to his inconvenience that reservations ahead are necessary. The country is more than two years behind in its building. As yet the construction records have not regained normal, but it hardly needs the "Own-Your-Home" campaigns to tell us that the building boom is coming, and it is coming soon.

When that time arrives it of course will bring with it its demands for house wiring and the outfitting of the home electrically. Here is the opportunity of the electrical contractor-dealer. It will be very easy to follow the modest wishes of the owner for an installation not too expensive on the order of what he has known—but the contractor who is a salesman will point out that the owner is building for the future. Electrical devices have not yet reached their maximum development of convenience and economy—nor are present rates for electricity indicative of what may come with further hydroelectric development and a more intensive use of small power consuming appliances. The owner who would look forward to not having his house out of date within a few years must provide convenience outlets and separate power service—he must have his house ready for the electric range and the electric refrigerating machine, even if the present stage of development in his community does not make it advisable to install these conveniences now. It will be a good investment. No owner should build a house he cannot sell—and if he builds one today which he will be able to sell for more than it costs him even after several years of use, it is a less expense to him than a house which actually cost less money. And nothing is a better selling argument than the convenience of the electrical installation.

The Pacific Coast Section, N. E. L. A., at their recent convention at Coronado expressed disapproval of the proposed establishment of a standard of ethics by the Bureau of Standards at Washington to outline methods of operation, the fixing of rates and like matters now governed by the various regulating commissions in the western states. This is distinct from the action of the engineering committee and although based on their recommendation, does not go so far.

The Journal of Electricity, in the past, after careful consideration had come to the conclusion that in the matter of the Line Safety Code, the attitude of the Bureau of Standards was one of open-minded helpfulness and that their efforts should be supported. With the Bureau still expressing willingness to modify regulations on a showing of necessity to meet western conditions, there appears no reason for modifying this view. The plan to fix a standard of ethics raises the question, however, of just what is the province of this government department, and of whether at the present time such questions as

rate fixing and detailed methods of operation should be attacked on a national scale. These matters are now very ably handled by the Railroad and Public Utility Commissions and with so many other vital questions to be settled, it seems unnecessary for the Bureau of Standards to enter this new field to unsettle the position of the present agencies, now accepted by public and power company alike.

It is unfortunate that the West should so continually be placed in a position of protest against national movements which on their face seem laudable—but there is a sound principle back of the difficulty. Without question national standardization in practices of rate regulation is a good thing—and the time will come when conditions will be sufficiently unified that it will be welcomed—but artificial standardization which would force diverse conditions into strained and surface similarity is of doubtful benefit.

The problem is one that is met with in every phase of the electrical industry, and beyond—in every national organization, in the nation itself and in this new international experiment we are about to try. There is a limit to the extent to which centralization is profitable. A central inspiration and clearing house of ideas is a necessity to progress—and there are certain fundamental processes which must be standardized—but in general, new growth and regulation should originate from those in direct contact with local problems. The healthy plant grows from the roots upward. The time may come when the world has shaken into strata of more universal evenness, but as yet problems are too diverse to be settled from a distance or from above. We have had an example of national rate regulations in the telephone—there is no need to multiply the difficulty in the case of the power companies.

The wildest of Jules Verne's adventure stories cannot match in interest the product of the research laboratories of the war period. There had been a general feeling before the war that the preceding twenty years had marked a period of such advancement along lines of applied science as could never be equaled in a similar duration of time. But the war has broken records here as elsewhere.

The story of providing ears for the submarine is told on another page of this issue. It is but one of the romances of the science laboratory. This was strikingly apparent to those who recently had the privilege of hearing Dr. W. F. Durand of Stanford University review the achievements of scientific research during the world war. It was divulged, for instance, that by applying a high frequency current to a certain crystal, rapid changes in volume were produced which sent forth sound waves of 100,000 vibrations per second. At this high pitch the sound would be concentrated into a beam which, sent out into the ocean, would be reflected back from such objects as submarines and indicate by the time taken for the "echo" to return at what distance and in what direction these were located. So powerful was

this beam of sound when sent out by a square foot of the crystal in question that it killed instantly all fish in its path.

Invisible signaling by searchlights of infra red rays focused on receiving stations with sensitive apparatus and by the variation of lights which appeared alike to the eye but were made up of different complexes of wave lengths possible of disentanglement were among the accomplishments of practical value which the war brought forth. Fascinating vistas of possible accomplishment are opened along every line of human interest. Given any problem and the facilities for experiment—it almost seems safe to predict that a solution can be found for it.

These results were obtained not through guess, nor the careful study of one individual, but through the concentration of many minds on the promising clues to the desired accomplishment. For the purposes of the war, the staff and the faculties of practically every laboratory in the country were pooled. Here lies the lesson for the future.

There are peace problems of no less importance to humanity than those of war. Can we not encourage on a national basis gatherings of experts for discussion of national problems, the establishment of additional laboratories for research and a closer cooperation between existing laboratories? There may be some features of adjustment to be worked out between industrial laboratories, but the facilities of our western universities could readily be exchanged. The range of vision of the research student would be vastly extended by opening to him the laboratories of neighboring institutions and the consequent gains in the results attained are indicated by the success of war achievements.

There are fully fifteen million of our population who are foreign born; counting the children of foreign born there are thirty-three million, according to a recent estimate of the Department of the Interior. Of these fully three million cannot speak English. This means that they are living in this country very much as they would live in their own, with very little higher standards of living. Not only that, but in many cases it means that they are spending as little as they possibly can and hoarding their savings to carry back with them at the earliest possible moment to the old world. The following quotation from an editorial in a foreign language paper urging the return to the fatherland (Serbia, in this case) is typical of this attitude:

The Foreign Market at Home

"Therefore, the most important help for our return to the Fatherland are—savings. It is necessary to carefully economize one's earnings and not to spend on unnecessary things. Reduce your expenditures to what is absolutely necessary for a decent living, and through a well planned saving system gather the money which will enable us to . . . participate in the future of our country"

Making a purely selfish application to the standpoint of the electrical man, this situation means millions of unwired homes—and millions of unspent dollars. It is estimated that fully a billion and a half dollars are today hoarded by foreigners in the United States with a view to carrying them back to the Old World.

The only solution of the problem is a thorough-going campaign of Americanization. Such efforts as that of the Youngstown Sheet & Tube Company who have since January, 1917, had a system of free schools to educate adult foreigners in connection with their factories in Youngstown, Ohio, are what will help to make good citizens of these people—and incidentally good customers in the future.

The organized efforts at Americanization of course must be the backbone of the movement, but here are some concrete suggestions as to what the rest of us might do:

Tell the woman who speaks little English that you want to show her something interesting. You can tell her that much with your eyes and hands and smile.

Show the woman who speaks little English some pictures, and if the catalog from which you are selling has some pictures in beautiful colors, show her those. With hands and eyes and smile, make her understand that the text is there to be read—for a song; the song of the English language.

If she would like to speak better English within a very short time, tell her you will, yourself, take her to a night school where she can learn; if you are a good salesman you'll be able to make your catalog her first English primer

If you are a good salesman you won't look critically about the homes of these foreign-born women. You have your work and they have theirs: Hers is likely to be a good deal harder than yours. Don't knock, even in your mind. Knocking never sold anything—but the other fellow's goods.

If you are a good salesman you'll know at a glance whether it will serve you best to speak of books or babies; if babies, there are likely to be plenty about. Talk of them, by hands and smiles and eyes.

Don't gush over the foreign-born woman. She has her reserve and her dignity to look after, even if she doesn't speak the language. Be kind and be interested and alert. You'll sell your goods.

The above suggestions are likely to serve you, but that isn't the only reason why they are made. They are made because America needs the help and good feeling and humanity of every one of her prospective citizens.

NEW JOURNAL SERVICE: So much interest has been shown in the series of articles by Miss Krause on the Business Library and in the course on Practical Electricity in which the Journal of Electricity is cooperating with the Universities of California and Oregon that back issues containing these articles are rapidly becoming exhausted. The Journal of Electricity will gladly allow 25 cents a copy on a subscription renewal for any numbers of the April 15th or May 15th issue returned to this office in good condition. In the meantime, until the present supply is gone every effort will be made to supply back numbers of the issues in question to all libraries desiring to commence their subscriptions with Miss Krause's series and to students beginning now with Prof. Bliss's course. In case copies are not available, reprints of back articles of these series will be sent free of charge on request to new subscribers, and allowance made for missing numbers in rating the subscription.

The Inspection of Electrical Installations Aboard Ships

BY F. A. ANDERSON

(The electrical installation on ship board must not only meet the conditions of similar work on shore, but must forestall all the difficulties which may occur at sea or in a foreign port. For this reason extreme care must be taken and a standard of workmanship maintained which will ensure uniform results. Some of the problems of ship installations as viewed from the standpoint of an inspector are here given as presented before the San Francisco Electrical Development League. The author is inspector with the U. S. Shipping Board.—The Editor.)

The Inspector must, of necessity, be one who is constantly on the lookout for faults and defects. In other words, "looking for trouble"; and it is a well known fact that when a man goes out looking for trouble, he usually finds it. This is true in the electrical business as well as in any other.

The Troubles of an Inspector —

There is, therefore, imposed upon the Inspector a very delicate and, I might almost say, diplomatic mission. He must be as wise as a serpent, harmless

result of defective work redounds to the contractor until the end of time.

Catching Mistakes —

It is impossible for any of us to be perfect, and the electrical contractor is no exception to this rule. Having planned his installation and started on the work, he follows with his plans, knowing that he has given to them faithful and conscientious consideration. He views them only in this light, and therefore is not apt to see mistakes which will creep in. The Inspector coming upon the work views it from a different angle; looks, as you might say, into the cracks and corners; tests it in unusual places and usually finds faults which the contractor has overlooked.

This thought was brought out to me very clearly by an incident in my own life: I was inspecting for the Government at a factory where they were also doing considerable architectural work. Now, architecture is something of which I know practically nothing, and I was very much surprised on one occasion to have their architectural engineer ask me to let him show me some of his intricate plans. Of course, I was interested, and looked wisely on. He explained his plan in detail, which was all Greek to me; finally saying "Thank you," when I replied: "This is all very interesting, but I don't know what you are talking about." He replied: "Well, I had made a mistake in my plans, and the best way to find a mistake is to start out and explain the whole process from the beginning; for in this way, when you try to explain the part that is wrong, you recognize the mistake." He further said, "It matters not that the party to whom you are explaining fails to understand the proposition." You see, his whole object was the realization of a mistake; its correction, a natural sequence.

Adapting Work to a New Field —

Of course, we all know that prior to the war our country was among the smallest in the ship-building industry and that our entrance into the war made us one of the largest. It was therefore necessary to use every facility and many installations were planned, based upon past experiences of most successful work in other fields of endeavor, which did not wholly meet the requirements of marine service.

If you will stop to consider, you will realize that an installation which may prove ideal in house construction, or factory equipment, will fall far short of success aboard ship. We must, therefore, look forward to correcting our viewpoints; we must exchange ideas and suggestions, looking towards the betterment of the electrical equipment of vessels.



SHIPS READY TO LAUNCH

From the ways the ships go to the fitting up yards where the electric wiring is done and the details of inner and outer fittings completed.

as a dove, and exercise the patience of Job. He must bring to the contractor's attention many faults and defects. He must secure their correction and he must at the same time retain the good-will of the contractor.

Often an Inspector is a very much misunderstood and unappreciated personage. The usual idea prevails that he is in the first place a crank—a person looking for faults which do not exist—a man who criticizes without providing remedies for corrections—a man who knows little and assumes much. In fact, I think there must occur to the minds of most of you a phrase of two words, which expresses the general opinion of the ordinary Inspector.

It seems to me that the Inspector is often placed in the position of the father who says: "Now, son, this is going to hurt me more than it will hurt you"; for it is rarely that the child sees, until after life, the justice of the father's correction, and it is also often that the contractor fails to realize until a later time that the correction of a fault when brought to his attention is more to his advantage than to that of the Inspector; for the Inspector is usually here today and gone tomorrow, while the



THE ELECTRICAL INSTALLATION

Every ship has its complete electrical installation involving lights, bells and radio. The foundation wiring is one of the first additions to the hull after it is launched. The tables shown here are for the use of electricians in handling conduit and fittings.

I want to say here that, of course, I have found many faults in the electrical installations aboard ships which have come under my observation; but I also want to say that I have found most ready and loyal cooperation among the contractors who were doing the work. They have responded most readily to suggestions and have brought forth improvements which have been both marked and satisfactory.

Electrical Installations a Source of Trouble —

We must face facts, however unpleasant they may be, remembering that failures in life may be made either stumbling stones and occasions to fall or stepping stones on the pathway to success, depending on whether or not we truly learn the lesson which they teach, or accept them as a final effort. In this respect I want to call attention to what seems to be a well developed opinion among ship operating engineers. It is, that the electrical installations aboard ships are a constant source of trouble; they do not complain of the facts—they accept them as a foregone conclusion. From their earliest experience it has been trouble; they view it as a patient going to the dentist, who expects to be hurt and is rarely disappointed. Now, I believe the reason for this is that we of the electrical profession have not given our best efforts to ships' installation. I hope for the time when we can devise a system so complete that electrical trouble will indeed be a rarity. Today every electrical appliance aboard ship is viewed with disfavor; but the time is not far distant when a full electrically equipped ship will be hailed as the most desirable vessel afloat.

Convenience on Shipboard —

Despite this prevailing opinion, electricity has proved a most valuable adjunct in the present day ship construction. The old oil lamps have been replaced by clean, wholesome and pleasant illumination. Search lights prove a valuable aid to the pilot

of the ship in dark ways and at difficult landings. Telephones transmit the master's orders to remote parts of his craft. The wireless outfit, through the aid of an electric spark, sends through endless space a message which brings succor in the time of need, or gives glad tidings of a danger past, and receives and sends news to an anxious waiting world.

Emergencies Must be Foreseen —

A ship proceeding to sea is a city within itself. Every emergency must be foreseen and provided against; for there is no great city of San Francisco with its full stocked supply ready at hand to meet a demand. The chief engineer must keep his mechanical equipment in constant operating condition, and the more rugged YOUR work, the more complete YOUR installation, the more reliable ITS operation, the greater have you served him, and it is through service to him that the electrical industry must seek and find its success in ship work.

The Inspector who finds your faults is your ally as your friend. He who serves a friend doubly serves himself.

Progress in Ship Building —

Let us look back to the ships of our early days, when nothing but wood was considered feasible, and then to the time when the steel ship was proposed, and the fears that it would sink of its own weight. Follow, if you will, from the time of the stern-wheel to the wheels on either side; or again to the screw propeller, and the reciprocating engine with its direct drive, replacing the old walking-beam, and then watch the progress of these engines to their development of triple expansion. And now, I must go carefully; for we have come to the point of the turbine driven ship, and while this has many adherents, it has not established itself firmly in the opinion of many shipbuilders of today.

I believe it was England who brought out the first turbine propelled ship, in the form of a torpedo

destroyer, about the year 1895. From that time on, the turbine has continued to take its place as a prime mover for vessels; but it has not yet reached its full success, though I am sure its advocates will continue their efforts until this goal has been reached.

An injustice would be done the shipbuilding industry if mention were not made of the concrete ship. Here indeed was the marvel of the age—making a rock to float. This was accomplished by the men of the West—they had vision, they had ability, they had faith, and they built "The Faith." Its accomplishment in the shipping world is now a matter of history, and from that history new incentives have been received, and concrete ships are nearing completion within our very midst, one of which will be launched in the very near future.

These vessels are not alone interesting from their departure in materials for ships' construction; but they have produced interesting developments in concrete progress. A sample of the concrete used shows its aggregate to be composed of burned clay. The burning of this clay expands it to its fullest extent, reduces its weight to a minimum, increases its hardness to its highest value, leaving it a vesicular substance, particularly adapted to receiving the cement and producing a concrete light in weight, firm in substance, high in tensile strength, and practically impervious to moisture.

The Electrically Driven Ship —

The next step in progress is the electrically driven ship. This may sound as a prophecy; but there rests in the Patent Office at Washington a patent, some twenty-five or thirty years old, which shows the dream of an inventor for a ship with many propellers, each driven by an electric motor. It contemplates an equipment including usual steam boilers, supplying steam to an engine which drives a generator from which the power is transmitted to the motors. This, you will see, transmits the power through four distinct units, but it contemplates the entire control of the ship from the bridge or pilot house. This idea was not wholly a dream, for the inventor had constructed a model of his ship and demonstrated it in many places. He even secured permission to place his model in the committee room of the United States Senate Committee on Naval Affairs. The model remained in this committee room throughout the remainder of that session of Congress, where it was viewed by many men of prominence and gained not a few friends, who saw in it the promise of a great future development. It was, however, years ahead of its time, and the inventor lacked the ability to engineer it to a commercial success. The seed had been sown and the electrically operated battleships of today are, in a sense, an offspring of this device.

But there is a step in another direction in ship propulsion and its future and success are also linked with the electrical industry. I refer to the Diesel type ship, or the ship with some similar form of internal combustion engine as a prime mover. In these ships electricity must play its part, and per-

haps the best success will be obtained through a main generator with propellers driven by the use of electric motors. This type of ship must, of necessity, employ electrically driven auxiliaries.

This is perhaps a digression from the subject of the inspection of electrical installations aboard ships; but I trust that what I have here outlined may shortly become the duty of such an Inspector.

The Lesson for the West —

One of the lessons I have learned in my adopted home is that the Westerners are not followers, but leaders in many fields of endeavor. When I first came out here, I had occasion to bring to the attention of one contractor a few minor faults in his installation. To my criticisms his foreman replied: "I guess this is as good work as you get in the East." And I said: "Suppose it is; does it make it right? Let us make this installation a standard and persuade the East to do as well." I want to use that thought for the motto of the electrical industry in the West. Let us face our failures squarely and honestly; take the necessary steps to correct them and set a standard which shall be the best, and let the North, the East, or the South attain it, if they can!

PRICE FIXING FOR DEFINITE PERIODS

If the value of things people buy were established in the minds of the people would there be the hesitancy in business we are now facing?

The individual producer is the one to say what price he must receive for his wares. His business judgment will not permit him to ask an excessive profit (that would invite competition and perhaps excess production with destructive results), and he certainly dares not quote prices which cannot return proper compensation to the capital and labor invested in his product.

It is the belief of the Lakewood Engineering Company that prices made effective for specified periods or seasons will establish confidence in prices, and they have therefore established the policy of telling their buying public what their prices are and that there will be no change for definite periods. To make the plan effective, they have deemed it advisable to make price periods of not less than six months.

If every producer who is not already doing so would adopt this plan, making his prices known to the public by advertising as well as by individual quotation, they believe that confidence would be restored and that the present enormous potential demand would be brought into action. Perhaps the best examples of this published, open-price plan are:

1. The retail drygoods business of the country whose prices are known to every individual through publication in advertisements and through tags on the goods in the stores.
2. The automobile industry, which once every season names its price to the public for that season so that every individual, possible customer or not, is made familiar with the value of the article.

These two industries are perhaps the only two large industries whose business has been and is now active since the Armistice.

Technical Hints

BY GEORGE A. SCHNEIDER

(Although bell systems in general are simple, there are numerous troubles which develop—and questions which are repeatedly asked. Here is an answer to most of the questions which will arise, as well as a table of commonly used symbols and a tale of advertising circulars with a moral.—The Editor.)

OPERATION OF ELECTRIC BELLS ON ALTERNATING CURRENT CIRCUITS

In the original installment of this article which appeared in the March issue of the Journal the application of bells primarily designed for battery service to alternating current circuits was discussed. It was shown that in sizes smaller than about five inches in diameter these types of bells on alternating current service were fairly satisfactory provided certain precautions were observed in making the installation. Also the reasons why larger sizes are not adapted for this service were given.

In this article bells designed especially for alternating current service will be discussed. In the trade catalogs these bells are commonly listed as "transformer bells" to indicate that they are designed for use with bell-ringing transformers. This term is to a certain extent ambiguous because, as will be shown later, bells of this design may be operated directly across power or light circuits of voltages as high as 250 volts without the use of transformers or resistors.

Transformer bells are now offered by several manufacturers. There is but little difference in the several makes, but when compared with bells of the common type for battery service many different details in construction are noticeable. The magnet cores and supporting yokes are laminated. This construction is necessary to permit the magnetism set up in the magnet cores by the windings to respond to the rapid changes in value and direction of the current in the magnet windings due to the high frequency of the supply circuit. The length and weight of the armature are carefully proportioned and of different construction than in bells for battery service, to give the armature a period of vibration which corresponds to the frequency of the supply circuit. This is necessary for the reasons pointed out in the first article. Armatures are mounted in one of two ways; either by the usual pivot construction or on the principle of a vibrating reed; that is, permanently fastened at one end. Contacts when used are of carbon; easily renewable and adjustable. One style of bell is so designed that contacts, even in vibrating bells, are not required; consequently, there can be no sparking. Bells of this design may therefore be installed in places where the presence of gas, inflammable vapors and excessive dust have heretofore made the use of bells dangerous, if not actually impossible. Further, it is noticeable that transformer bells are better insulated than the ordinary type of bell.

Transformer bells are obtainable in sizes ranging from 2½ to 18 inches, for multiple or series

circuits; for voltages ranging from 6 to 250 volts inclusive, and for all commercial frequencies.

Bells of these types are becoming very popular for installations involving a large number of bells or bells of large sizes, such as in apartment buildings, hotels, schools, factories, mines and public buildings. Their first cost is somewhat higher than bells for battery service but this is offset by the saving resulting from eliminating batteries and the subsequent expense for recharging or renewal of batteries. The cost of current to operate even large bell systems is negligible when computed at the prevailing rates for electric service.

To secure satisfactory service from bells of this character there are three essential requirements to be considered: first, transformers must be ample capacity; second, the secondary voltage of the transformers must be suitable for the bell windings; third, circuits of any considerable length must consist of wires of larger size than ordinarily used for bell work.

As previously stated standard transformer bells are obtainable for circuits ranging from 6 to 250 volts inclusive. One of the leading manufacturers of these bells has adopted 6 to 18 volts as a standard. The catalog information applying to this particular line states that the bells are not sensitive to voltage changes and will operate on any secondary ranging from 6 to 18 volts. Another manufacturer winds bells of this type for 18 volts and recommends a voltage of not much less than this value at the bell terminals. In any case it is best to employ transformers having several secondary voltages as this arrangement is more flexible, permitting the voltage to be selected according to the requirements of the bell windings and to compensate for the voltage drop incident to the longer circuits. Transformers should also be located as near the bells as possible to further prevent excessive drop in the bell circuits.

The energy required to operate these bells will of course vary in the different makes, but a safe rule is to allow 3 watts each for 3 and 4 inch bells and for buzzers; and 6 to 8 watts per bell for sizes 5 to 12 inches, inclusive.

In connection with these estimates of the energy required by bells, the following tests made on an installation in a large school building equipped with 76 miscellaneous bells and buzzers will be of interest:

No. of Bells Ringing Simultaneously	Secondary Voltage at Transformer	Watts Measured at Transformer	Average Watts per Bell
3—8" Bells	15.7	38	12
12—8" Bells	15.5	99	8
15—8" Bells	15.4	111	7.5
Entire System			
30—8" Bells	15.0	176	2.3
6—6" Bells			
11—2½" Bells			
29—Buzzers			

These figures include not only the current actually taken to ring the bells, but also the losses in the secondary or bell circuits. It is interesting to note that the current required per bell is somewhat diminished as the number of bells connected to the transformer is increased. This information is taken from data published in circulars issued by the P. R.

Manufacturing Company, former manufacturers of transformer bells.

To secure continuity of service from installations of this character the wiring should be installed in a first class manner. Not enough attention is generally given to this matter and the wiring usually proves to be the weakest link of the system. For small jobs requiring two or three bells or buzzers, such as in residences, the ordinary method of installation using annunciator wire and insulated staples should be satisfactory if the wiring is carefully done. For large installations, however, such as in schools or similar buildings, where repairs would be difficult and costly, there is no good reason why wiring should not be done strictly in accordance with the Code requirements covering interior lighting systems.

There is another point that should not be overlooked where bells are to be operated direct from lighting or power circuits without transformers; that is, push buttons of the ordinary type should not be used. They are not sufficiently well insulated and are not rugged enough to give long life due to the more severe arcing at the contacts on the higher-voltage bell circuits. For this purpose single circuit switches of the momentary-contact type are recommended. These can be obtained in several sizes and of suitable dimensions to fit standard switch boxes or similar fittings.

Bell systems in general are exceedingly simple, perhaps so much so that very little thought is given to the subject. However, judging from the number of questions asked about bells and installations of the type here discussed and the numerous troubles that are brought up from time to time by electrical contractors, it is apparent that there is need for some specific information on the subject. That is the purpose of this article and the original one already mentioned. The writer hopes the facts given will be useful to those who have to plan or otherwise handle such systems.

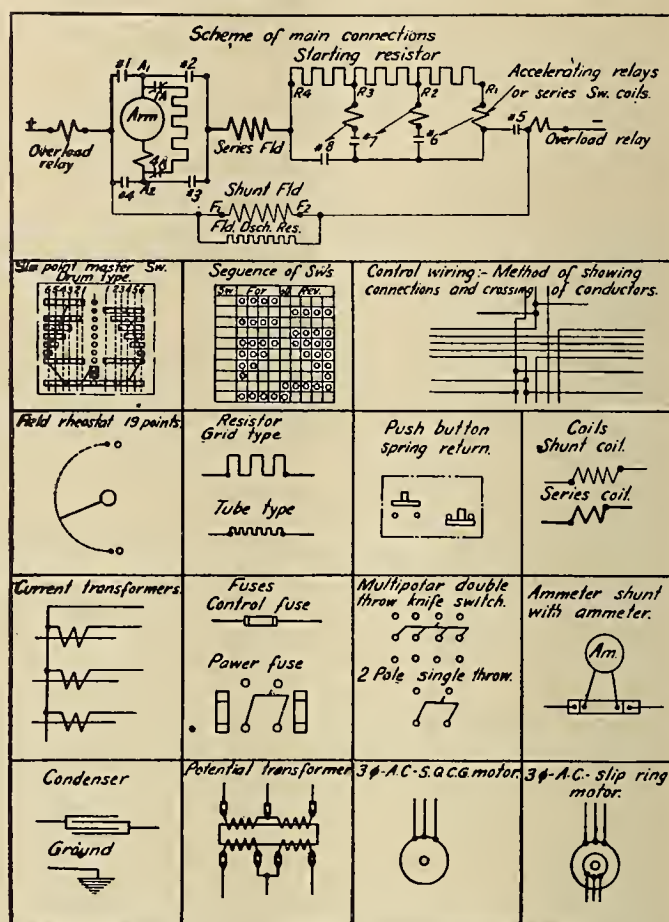
SYMBOLS AND ABBREVIATIONS FOR CONTROL DEVICE DIAGRAMS

The series of symbols and table abbreviations given on this page will be helpful to those of our readers who have to do with the installation of industrial control devices. These are taken from the hand book of the Electric Power Club and are the standard symbols and abbreviations adopted by that organization for industrial control connection diagrams. Practically all prominent manufacturers of motors and controlling devices in this country are members of this club. We may therefore expect these symbols and abbreviations to come into general use in the near future.

The method of showing connections and crossing of conductors represents a marked improvement over the earlier methods. The old custom was to indicate the crossing of a wire over another wire by means of a loop or semi-circle. In the method here shown this loop is eliminated but dots are placed at the points of connection between wires. Carrying

out this scheme produces a much neater and more easily read diagram. It is also more easily drawn.

The adoption of these standards will greatly simplify such diagrams and make them easier to



A table of standard symbols as adopted by the Electric Power Club and in use by practically all prominent manufacturers of motors and controlling devices.

understand. For these reasons we recommend that our readers who have occasion to use diagrams of this kind become thoroughly familiar with these symbols and abbreviations and use them in their daily work at every opportunity.

A MORAL ABOUT ADVERTISING CIRCULARS

Some few weeks ago a salesman called upon a merchant to introduce a new line of specialties. He was obliged to wait a while for his customer. While doing so he happened to notice the young lady in his customer's office opening mail. He immediately recognized one package as coming from his firm. It contained information on the very line the salesman had come to talk about. But the young lady, seeing the package contained circulars, threw it in the waste basket. Later the merchant was interested and asked why circulars about the line had not been sent. Then he was shown the disposition of those which had just arrived. And the salesman came away with an order.

Moral: A business man who throws advertisements and circulars into the waste basket without at least learning their purport is throwing away many ideas that would be of decided profit to him. It's like throwing away bread — a sin.

Western Ideas

A FACTORY LAUNDRY is an enterprise which has been undertaken by a Southern cotton mill, with mutual saving of time and labor for employers and employes. The Textile World Journal in describing the institution states that not only were the women absent a day or two every week, but that two hundred housewives, each doing her own washing every week, involved a total loss of two hundred days' labor for that period. Under the factory laundry system eight to ten people working six eight-hour days can do the washing for two hundred families—that is, in less than one-quarter the time required by the 200 housewives, and with a tremendous saving in drudgery, materials and earning capacity for them.

The prices are extremely reasonable: fifty cents for a five pound bundle delivered ironed, the price per pound decreasing as the bundle grows larger. In some mills the whole family washing is taken at five cents a pound, and sent home rough dry.

Community undertakings such as these are indicative of the tremendous savings which can be effected by organized effort, eliminating the unnecessary duplication of labor and materials.

THE DIFFERENCES IN WINDOWS and their effects on sales is remarkably illustrated by this story from the Electric Supply and Contracting Company of Vancouver. A number of portable lamps had been on display in the windows for some time, but the sales were extremely disappointing. Then someone hit upon an idea. One day the window was entirely occupied by an attractive bed in which sat a large doll assiduously reading a booklet. To the rails of the bed above the doll's head were attached two of the lamps, and near by was a large card bearing the words, "DO YOU READ IN BED?" The

results of this were phenomenal and immediate. The stock of lamps was speedily exhausted and a new shipment wired for. Long after the window display had been removed, customers who remembered seeing it were still asking for the lamps.

For those who are skeptical about the effects of originality on potential customers, this should be an interesting proof of the really astonishing results which this factor can bring about.

AN INDEX TAB, made of cloth, and gummed ready to be affixed to the file, is a small but much-appreciated convenience which accompanies a catalog sent out by an electrical firm. Small additions of this kind not only assist the office to which the catalog is sent, but serve to draw attention to the firm which sends it.

INSTRUMENTS
AND RELAYS

Paste on cover of
Catalogue 3-B, 3"
from top, to serve
as an Index Tab.

THE FIRST MODEL ELECTRIC KITCHEN to be established in any San Francisco store was opened a short time ago in the Emporium. This unique display is to become a permanent feature of the Household Department, and has already attracted much attention.

The electrical equipment is all standard material of the highest type, and consists mainly of an electric range, air heater and water tank, the latter being in connection with a regular thirty-gallon tank. Supplementing the above are to be found the electric iron, percolator and fan. The whole arrangement and beauty of this kitchen can best be conveyed by the accompanying picture.

Adjoining the kitchen is shown a model electric laundry in which the electric washing machine and mangle are the main features. Competent sales people are at hand to give complete information pertaining to the home electrical, and substantial sales results are assured.



The model electric kitchen installation of the Emporium, one of the largest department stores of San Francisco. Stove, water heater, air heater, iron, percolator and fan are displayed here—and in an adjoining room is a completely outfitted electric laundry.

Here we have one of the greatest department stores of the country featuring this heavier equipment for the home—they are looking into the future when the demand for toil-savers and articles of intelligent economy will be found in all regulated homes.

THE EDUCATION OF THE CUSTOMER is one of the objects of this announcement sent out by the San Joaquin Light & Power Corporation of Fresno on the backs of its bills. A series of large newspaper advertisements on the same subject is also being run by the company. A more widespread knowledge of electricity is not only highly desirable, but essential

WHAT DO YOU KNOW ABOUT ELECTRICITY?

The University of California, in cooperation with the Journal of Electricity (San Francisco, Cal.), offers you an unusual correspondence course in the theory and practical application of electricity.

THE BOY ON EVERY FARM—IN EVERY HOME—THE EMPLOYEE OF EVERY BUSINESS CONCERN CAN BECOME AN EXPERT

Professor H. H. Bliss, M. S., University of California, is instructor. The course treats chiefly of direct currents, simple currents and direct current machines. It will enable the man on the farm, the man in the home, the man in the shop, to handle and repair all electrical equipment. The services of the paid expert no longer will be needed. You can become your own expert.

The course is given in conjunction with a series of articles in the Journal of Electricity as the text. Students must have access to this magazine to take the course. Supplementary material is sent from the University of California in the same manner as for all other University Extension Correspondence Courses.

The course comprises fifteen assignments, each covering a different phase of the subject. Fee for course: University of California, \$5.00; Journal of Electricity, \$1.50.

For further information and enrollment blanks address:
University of California, Berkeley, Cal.
Journal of Electricity, San Francisco, Cal.
San Joaquin Light & Power Corporation, Fresno, Cal.

How many of your customers regard electricity as a mystery?

There is already an enrollment of eighty-three in the course on Practical Electricity offered by the Journal of Electricity in conjunction with the University of California, many of whom are prospective customers of both electric ware and current. Here is one of the methods employed by the San Joaquin Light and Power Corporation to bring this course to their attention.

to the progress of the electrical industry. The best customer is the intelligent customer, and in thus cooperating with the University of California and the Journal of Electricity the corporation is accomplishing the double purpose of giving the course wide publicity and advancing the interests of the industry. The idea, also, of using the backs of bills as an advertising medium is one which might be more widely and variously employed.

A FOLLOW-UP SYSTEM OF TROUBLE CALLS has been instituted by a large central station company. All trouble calls, after they have been remedied, are registered at a central department, and the following day each customer who has reported trouble is called on the telephone to see if everything is satisfactory. Courtesies of this kind have a marked effect upon the standing of the company in the communities which it serves, and are rendered at a very small cost to the company.

CONVINCING PROPAGANDA, in the form of hot rolls and pastry cooked in the dining room, was employed at a joint luncheon of the Utah Manufacturers' Association and the Federated Women's Clubs of Salt Lake City. The organizations had met to formulate plans for the observance of Utah Products week, and part of the menu, which consisted entirely of Utah products, was cooked before the eyes of the guests in a large Hughes bake-oven installed in the dining room.

WINDOW DISPLAYS THAT DRAW A CROWD are not very numerous, fortunately for the traffic police, but to obtain this picture of the Utah Power and Light Company's window in Salt Lake City the photographer had to get out at seven in the morning, before the people blocked the view. An electric washing machine might not strike the unimaginative mind as a particularly attractive subject for window display, but when it is in motion, and adorned with a party of lively dolls executing acro-



Small dolls were attached to the moving parts of the machine and performed elaborate acrobatics when the machine was set in motion

batic stunts on the moving parts, not one person in ten passes it without stopping. Movement in window-displays is a device which seldom fails to catch the eye of the passer-by, and the human interest provided by dolls, animals and so forth inevitably rivets attention—and, as everyone who has anything to sell knows, this is half the battle.

BOOSTING A CONVENTION by means of a brilliant red and white sticker is the idea of the British Columbia Association of Electrical Contractors and Dealers. This one happened to come to us



Boosting a convention by a sticker used on letters and envelopes

on the back of an envelope, but a sticker is a small and adaptable thing, and has tremendous possibilities as an advertising medium. The decorative propensities of small boys have convinced us that a sticker may be affixed to almost anything; and while we would not suggest quite such promiscuous use, we think there are many other effective channels for stickers in addition to the judicious use of the mails.

Notes of California Electrical Cooperative Campaign

(The following extracts from reports of the campaign field representatives show conclusively that the contractor-dealers of California are in general now fully alive to the importance of retail appliance and lamp sales and to the necessity of being in a well located, attractive store room. The quotations from these reports may also serve to give a more distinct idea of some of the activities of the field men as well as of additional results being secured by the Cooperative Campaign.—The Editor.)

C. A. Holland, San Diego —

Mr. Holland has recently moved into a new store which is a considerable improvement over his previous place of business, which was just a small booth in a furniture store. He is giving the retail business much more attention and is pleased with the results that are being secured. Several suggestions were given him for the improvement of his store as well as for increasing his retail business.

Ankrum's Electric Shop, Hemet —

Last trip Mr. Ankrum had no one to attend to his store and it was closed practically all of the time. Mr. Ankrum was then impressed with the necessity of getting a girl and keeping the store open at all times, and this has been done. Mr. Ankrum told me of his plans to move to a better location and with him I looked over two stores which he had in mind, and we decided on one which he will lease and move into about April 20th. I laid out the entire store for him and he will arrange it as suggested. It will be a great improvement over his present location and will improve the situation here, as the central station is quite a distance from the center of town, as is the dealer's present store. I secured Mr. Ankrum's application to the Contractor-Dealers' Association, and the influence of the association should help him to improve his business methods.

Lewis Electric Company—Harry Lewis, Fresno —

Put in a trick lamp and gave Mr. Lewis a number of suggestions for improvements. He says that he is going to entirely rebuild the interior of his store and will be able to use a number of the suggestions given him.

Townsend Electric Company, Selma —

Found this store moved to a new room which is much neater than the old one. He has not enough appliance stock, and I suggested more stock and laid out for him plans for selling washing machines and vacuum cleaners.

Joseph Lieb, Anaheim —

Mr. Lieb has been intending for the past year to build a store of his own and was delayed by the government restrictions on building. However, he now has the plans of his building and intends to start building soon. I talked the matter over with him in detail and told him that it would be advisable for him to build as soon as possible, but not as elaborate a building as he had planned. It might seem at first thought inadvisable to suggest a less expensive store than a dealer had planned, but in this case there is no question that it was best, when all points were considered, to have this dealer spend about three thousand dollars on his store instead of eight thousand or more as he had planned. His blue prints were gone over with him and plans were suggested for the store, the cost of which will be such that the investment will be profitable to him and yet the store will be attractive. After discussing the entire situation with Mr. Lieb he was convinced that it was best to do as we suggested, and will as soon as possible start construction on the store.

Lentz and Harrington, Modesto —

Mr. Harrington is now back from the army and they have enlarged the store. Had a long talk with him on the merchandising end of the business. A plan for a campaign on washing machines and vacuum cleaners was laid out and they promised to follow it. It will enable them to sell several machines.

George Bullock, Los Angeles —

Mr. Bullock has been doing electrical contracting from his residence. He has just opened up a store in the residence district and at his request, through Mr. Arbogast, I called on him and laid out the store with him. Numerous merchandising ideas and suggestions for building up his retail business were given him.

Fresno Electric Company—Mr. Curry, Fresno —

Saw Mr. Curry at the meeting, but he had gone to the city when I called at his store. He has made no improvements in his store, but has completed arrangements to move into a new store and will do so at once.

Star Electric Company—Mr. Scheley, Bakersfield —

Was glad to find that this firm had moved over to a better location in Bakersfield proper. The present store is very neat, although at the time of my visit he had no stock. He had an attractive window display and I assisted him in putting in a moving feature display. Also gave him a number of suggestions for arranging his new store and how to handle it.

Cope Electric Company, Santa Ana —

Mr. Cope is now giving more careful attention to his store and as a result is enjoying a better business. He has occupied only a little over half of the store, but now has all of it and is doing extensive remodeling. Three hours were spent with him in laying out his store and suggestions for its improvement were given as well, as ideas for increasing his retail business. On one side of the store he had a counter about twenty feet long, which is two or three times longer than necessary, and detracted from the appearance of the store. Contractor-Dealers often make the mistake of having a long counter occupy too much valuable space. Long counters do not add to the appearance of a store and are not at all necessary. I suggested to Mr. Cope that he cut off half of this counter and put a show case in its place. He said he would do this, so I helped him saw the counter in two and put the show case in place.

Gould, the Light Man, Stockton —

Mr. Gould is getting ready to move into a much better location in a better store room. Business is very good with him and his new location will give him a big increase.

Thos. F. Marshall —

This dealer's store and show windows were as usual attractive and as a result of good merchandising he is doing a very good business. Several merchandising suggestions were given him and will probably be followed up at once. Mr. Marshall is still considering putting up a store building of his own and expects to do so within the next few months. He is very much pleased with the cooperation he is receiving from the Southern California Edison Company.

Lantz Electric Company, Long Beach —

This dealer is giving his retail business considerable attention and is doing excellently in it. He now has one man outside all of the time following up prospects on vacuum cleaners and washing machines and is looking for another good man. He is still on the lookout for the best location he can secure and will obtain it as soon as possible, at which time he will, with our assistance, put in one of the most attractive electrical stores on the Coast.

The Case for Private Ownership

BY E. O. EDGERTON

(Here is a straight from the shoulder talk given by the president of the California Railroad Commission before a representative gathering of the electrical industry in the West at the banquet which concluded the session of the Pacific Coast Section N. E. L. A. at Coronado. It is a stiff program—but it brought cheers from those who heard it. Have you adopted Commissioner Edgerton's slogan in your business?—The Editor.)

It is a difficult thing, of course, to face an audience of this kind as a guest and say the things I will have to say to you in order that I may acquit myself as an honest man and one who is frank. I have watched this convention with care. I have taken occasion to sound opinion.

An Atmosphere of Doubt —

I find that running all through this convention is an undercurrent of anxiety. There is a lack of absolute confidence as to "where you go from here." There are various opinions, none of them sounded with the complete air of conviction. There is an atmosphere of doubt. The question most frequently put to me is, "What about the spread of public ownership?" And that is really a natural expression of the question that is in the heart of each of you: "What is the attitude of the public toward you gentlemen who for generations have conducted the vital operation of serving the public with the utility services?"

This question, of course, is put in many forms, but underlying all of these questions comes in the main query: "What is to become of you? Has the public lost confidence in these men who have conducted this important business for the public for all these years? Is it about to repudiate you? Is it about to say, 'You who have served us, have not served us successfully. You have not been good and faithful servants. We propose to undertake ourselves the job you have failed to do for us adequately'?" — a serious question, gentlemen, for each of you to ask yourself.

When the Lights Went Out —

General Gordon, who used to be a railroad commissioner, held a hearing in a place whose name I may not mention. The question involved was the electric lighting service and the telephone service. Many complaints had come to the commission about these two services, and it was finally determined to have a hearing to inquire into the question as to whether or not these complaints were sound. So General Gordon proceeded to the community to hold a hearing. Necessity required that he hold this hearing at night, and he did, and the hearing proceeded with the usual evidence on the part of the company that the service was good and on the part of the consumers that it was bad. And finally the attorney for the electric company arose and in a most eloquent way put before Commissioner Gordon the beauties and the continuity of the service. The attorneys for the telephone company stood by, waiting their turn to defend and to praise their service. He finished with a magnificent peroration about the service, and as he finished and as he was about to

declare that while the history had been bad, the service was good now, the lights went out!

But the company had an excellent stand-by service of tallow candles, and so the candles were brought in and the general decided that the proceeding would be carried through to a finish if he had to conduct it in darkness. But in the meantime, he insisted that inquiry be made over the telephone why the lights had failed. They rushed out and soon they came back and said the telephone wasn't working.

The general that night, and he was a religious man, in going to his hotel, walked four flights of stairs with a candle in his hand because there wasn't juice to run the elevator, and as he went, he sang, "Lead, kindly light." And when he got back to San Francisco the general told us, "I have got the goods on them people."

Is the Service Good —

Has the public got the goods on you? — And after all, that is the question. The question of municipal ownership as compared with private ownership will not be determined upon any discussion upon a doctrinaire opinion whether public ownership is good or bad, but upon the conclusion of the people as to whether or not the private agency now operating is successfully meeting their needs. If the judgment is adverse, there is really only one other alternative, and that is public ownership. Remember that you are operating a monopoly. There is no place the people can turn to if the people become dissatisfied with your service.

And remember, after all, we are Americans, and that an American will not stand insolence from any source; he will not stand bad service. He will rebel, and if he faces a monopoly that will not give him adequate service and meet his needs as he conceives those needs, he will do the job himself. And gentlemen, you are Americans, and you would do the same thing yourselves.

In my judgment, the issue is not "Shall we have public ownership or private ownership at the moment?", but the issue is "Will the private agency successfully meet the needs of the public?"

The Answer with the Public Utility —

And in my judgment, also, the case is not finally settled. You are at the bar of judgment, gentlemen, of public opinion, and the evidence is not all in. But day by day it is coming in, and it is either adverse to you or it is favorable to you.

The question of what character of evidence shall come before the bar of public opinion, in my judgment, rests with you, and that is why I am interested to come down here, because I feel that right here,

right among you men who have control of the public utilities and are giving the services, with you rests the question finally, "Shall we have public ownership or private ownership?" Gentlemen, it is absolutely up to you. Your contact with the public will determine this question. Make no mistake about this: that you are serving to the public the most essential needs, the things that the people absolutely depend upon.

Up to this time this service has been entrusted to you, and dependent upon how you give this service, dependent upon your ability to convince the people you are giving this service, will depend the question of whether or not their verdict will be favorable to you. And remember, it is not your judgment, nor my judgment, of what kind of service you are rendering, but, it is the judgment of the people; and no matter how you may feel about the perfection of your service, if the public is not convinced of that, gentlemen, your day is done.

Preaching Service —

I have listened with interest and, frankly, some surprise, at the resolution adopted by this convention, at the report put before the convention by Mr. Britton today, and I have wondered, as I listened to that report today, whether the full import of the words that he was uttering was really appreciated by this convention.

William Allen White, speaking of President Wilson in his career in France, said in one of his articles that "Here was a middle aged gentleman rambling over Europe preaching revolution without realizing it." And I wonder if Mr. Britton was preaching revolution without realizing it.

Gentlemen, if the resolutions are carried out that this convention has adopted, there is not any question about your future.

But do you mean what you have said? Do you mean it in the sense that you are willing to make sacrifices to make good on that pronouncement? Do you mean it in the sense that you are willing to bend every effort to make good this slogan? If you are not willing, the words had better never been uttered, because they will rise up to mock you.

Backing Up the Promise —

The public is tired of promises. It is tired of mere pronouncements. It has listened to arguments on the question of public ownership and private ownership until it is utterly confused as to the merits of the two. Coming in that condition of the public mind, in a pronouncement such as this convention has made, if not backed up by action, gentlemen, look out for the consequence. You had better not ever have uttered those words.

What have you said?

You have said that your prime duty is service.

Words easily uttered. Words easily possible of being forgotten. Words, the significance of which possibly may not sink in.

But do you realize that if the prime purpose of the public utilities of California is to give service, that that means that every man in this convention who has endorsed that statement must stand up, if

he is an honest man, and fight in his board of directors, he must fight in his management, he must fight in his every sphere he occupies in the public utility camp, if the attempt is made to forget that statement, brush it aside in favor of profits or bonuses or any selfish purpose, and say, "I have committed myself to the proposition that service is first and I am going to fight for it regardless."

Are you in that frame of mind? Are you prepared to make that fight with comparative danger to yourselves?

Well, if you are not prepared to make that fight, gentlemen, take the easy way. Your day is over.

The New Order —

We are fond of saying that since this war a new order has come, that the old order no longer prevails. And what do we mean by that? Are you serious in that statement? Do you mean it? And if we mean it, what can it mean except that throughout the great body of our people a great shifting of ideas has occurred, not here and there, not the mouthings of a crank in the advocacy of a doctrinaire opinion, but if we mean anything, we mean by that statement that throughout the great body of our people has occurred a great shifting of doubt, a change of thought, new ideas, and if that is true, there is only one possible way for you gentlemen to meet that condition, and that is to change your ideas and to change your doubts to conform with the new conditions. And if you don't, you go.

Gentlemen, if you mean what you say, if we mean that there is a new order, that the old order has changed, if we do not mean that these words are mere mouthings and mean nothing, now are you prepared, gentlemen, are you prepared, you managers, you executives, you lieutenants and captains and privates all through the ranks of the public utility service, to mean what you say, that service is first? Are you prepared first to convince yourselves that you are sincere in that statement? If you are, there is no obstacle in your path. You can convince the people. If you are not sincere in that statement, your job of convincing the people is utterly hopeless. All the advertising in the world, all the explanations you may make, all the excuses you may put forward, will count for nothing if you are not prepared, with conviction in your own soul, to go to the people with the proposition that their welfare comes first.

Are you prepared to do it? Is private ownership and operation equipped to do it? Is it free enough to do it? Is it free enough of control of financiers to do it? Is the financier convinced that it is necessary now to adopt this attitude?

If, anywhere along the line, gentlemen of control in the public utilities, you are not convinced of this proposition, the whole scheme will fail. And is there that conviction in you from the top to the bottom?

The Only Way to Win —

I realize, of course, that it is a tremendous thing to ask. It is a tremendous thing to ask that you get this new conception, that every single one of you get it, that every single one of you is prepared to make sacrifices of time and effort to put it into effect.

But is it worth while? Gentlemen, the world war is over and there is a new battle ahead, make no mistake about that. You are going into that battle, and you are going in as American gentlemen, upholding the idea of giving to the people service through private ownership in public utilities to the extent that you practically make that an ideal. And you are going into this battle, if you are going to win, with the new weapons, not the old ones, with the bunk all cut out, with all of the old schemes of political manipulation, bunk advertising, fake excuses, gone. You are going in, if you are going to win, to battle for public opinion with the new weapons:

Service first.

Patience.

Honest explanation.

The determination, first, that your cause is righteous, and next, that the people shall understand this cause.

If you don't go in that way, gentlemen, save yourselves the trouble. You have lost in advance. Have no doubt about that.

Public Ownership Never Dead —

We hear the idea expressed that public ownership is finally killed by the concrete examples that have occurred in the railroad and telephone situation. Disabuse your minds of that immediately. Let me tell you why.

There is no question that at the moment public ownership nationally is in disrepute. There is no doubt that if the question was put to the public, Shall we own the railroads and telephones? the proposition would be overwhelmingly defeated. Dare you rely upon that fact to go ahead in the old way? Let us see.

Gentlemen, if the railroads and telephones are turned back, as they will be, to private ownership, private ownership is going through the most severe test it ever had in this country, and if it fails in that test, there is not any question as to the result.

Private ownership is going against increased operating expenses, and unless remedial legislation is adopted which will give it a fair chance, it is hopeless of success. In the telephone situation, it is no news to tell you that the people are literally enraged; and look out, when the telephones go back to private ownership, that the people will not wreak vengeance upon the private ownership.

Gentlemen, I speak of this to you so that you will know that you will never kill the public ownership idea. And it is well that it never be killed. Among others, I have strenuously advocated monopoly as against competition. I see nothing good in competition and I believe that the public utilities should have an absolute monopoly in this field. But remember that with that monopoly goes a tremendous responsibility. And also remember that always the people have the alternative and they always will have it, in my judgment: they may turn always to public ownership. And so you will have it always with you, and it is well that you do. It is well for all of us, in my judgment, that we have before us the possibility of failure unless we exert our utmost

efforts. And so you cannot kill the public ownership idea. It will stand there always as a challenge to you to do your best. But remember, it will stand always as a contrast.

If the conception prevails among the public utilities that these great organizations are existing merely for profit, then always will be contrasted with that situation the organization that does not exist for profit, which is the publicly owned utility.

An Ideal Above Profit —

Let me say here, gentlemen, that while of little experience in management, while of little experience in control of large bodies of men, it is my observation that you cannot build up an organization of human beings in America that will work and fight at its best merely for profit. And so I suggest again that all down through the ranks of the public utility companies must go the ideal of serving the people with these great essentials of life and comfort, an ideal above profit and loss. You will not get that kind of service from the employees, from the managers themselves, that is absolutely requisite now, if you wish to save this scheme that I assume you believe in, private ownership, unless such an ideal prevails.

Having said these somewhat severe and pointed things, let me say this: that the public utility business in California, as I have observed it, has attracted the brightest minds in the state. There is not any industry in California that is manned and captained by the ability that the public utility industry is today in this state. Therefore, if you fail, it will not be because of a lack of ability, but it will be because of other things.

And as I have met each of you and as I know the public utility men in California, while I am not prepared to say that you are going to win, I am almost prepared to bet on you.

NEW METHOD OF PAYING WAGES

The well-known firm of British soap makers, Lever Bros. (Ltd.), is contemplating the introduction of a new method of paying wages, which the chairman of the company thus outlined at the recent annual meeting of shareholders:

As to payment of wages, we want to introduce a different method. Instead of our men crowding round the wage office and waiting their turn, each man should have a little private banking account in a bank near his own house—not the firm's bank, but one of his own selection. We would advise our bank to credit each man from the pay sheet with the amount of money he is entitled to receive for his wages. Under this system a man will draw out of his bank what he wants for his household expenses and what he does not need will rest in the bank. The amount left as deposit with the bank will be supplemented by an addition from the firm—we are favorably considering this—and this will give a man 5 per cent on his money left in the bank; so that, instead of the money lying at home earning no interest, by adopting this system it will earn interest. Further than that, the tendency will be always to leave a little more each week in the bank, and I feel confident that if we can get this system universally adopted it will not only raise the workingman's position but add to his dignity, because, instead of crowding round a little pay office, he will be led to become a saver, having money to invest in the business he is engaged in, or other businesses.

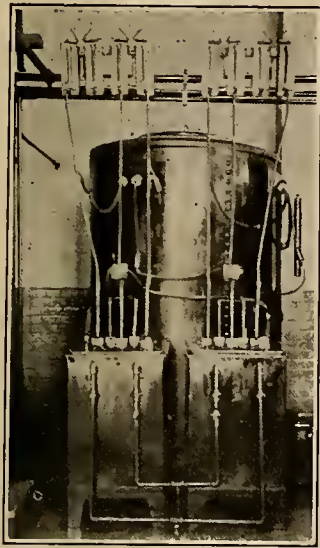
Mercury Arc Tube Operation

BY R. W. KIDD

(The importance of the mercury arc rectifier in the electric lighting field gives particular interest to this Portland data on its operation. The difficulties which have been encountered and the methods which have been worked out to meet them in actual practice will prove of value to others handling similar delicate apparatus. The author is chief operator of the Knott St. Substation of the Portland Railway Light & Power Company.—The Editor.)

Early Installations —

The first installation of Mercury Arc Rectifier sets by the Portland Railway, Light and Power Company was made in 1906 and 1907, at which time about fifteen 4 ampere 50 lamp single tube sets were put in operation, part of them at the Alder street substation and part at the Knott street substation. The operation of these single tube sets was far from satisfactory and all sets were soon changed for dou-



The total mercury arc equipment of the Portland Railway system includes 27—33 cycle sets and 26—60 cycle sets, all having a primary voltage of 10,000 v., except 11 of the 60 cycle sets which operate on 2300 v. primary. This is an oil immersed 60 cycle set with constant current transformers and horn gaps.

ble tube operation, making the capacity of each set 75 lamps. In 1909 all the sets at Alder street were taken to the new substation at First and Jefferson streets, located just outside the proposed d.c. underground district. The original installation consisted of oil cooled constant current transformers with air cooled tubes, the tubes being cooled by a blast of air from motor driven fans provided especially for that purpose. The newer installations consist of air cooled transformers and oil cooled tubes, the tubes being submerged each in a separate tank of transil oil cooled by circulating water coils. At the Knott St. Substation the air cooled tubes were replaced with oil cooled tubes for the purpose of bettering operating conditions.

Present Equipment —

The total mercury arc equipment at the present time is made up of twenty-seven 33 cycle sets and twenty-six 60 cycle sets, all sets having a primary voltage of 10,000 volts, except eleven of the 60 cycle sets that operate on 2300 volts primary. All 60 cycle sets have oil cooled tubes. Fifteen of the 33 cycle sets have oil cooled tubes while the balance have air cooled tubes. All sets operate on an individual circuit, except that at one station a 75 light set and a 50 light set are operated in series on a circuit carrying 91 lamps,

Details of Operation —

The constant current transformers require nothing more than ordinary care for successful operation but with the tubes much more care and attention is necessary. Temperature conditions are especially important. If the tubes are cold they will be slow to pick up and much static will probably be in evidence. In stations where air cooled tubes are used any direct draft of cold air against the tubes is usually checked an hour or so before the tubes are started. In the case of oil cooled tubes some sort of a heating device is installed in or about the tank to keep the oil at an even temperature at all times when the tubes are not in operation. Quite a satisfactory method to keep oil cooled tubes warmed up during the day is to keep a burning 50 watt lamp

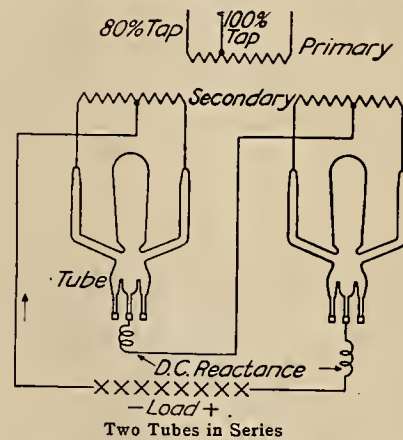


Diagram of double mercury arc tube rectifier connections

immersed in the oil. An oil temperature of about 85 degrees Fahrenheit in oil tanks seems to give the best results.

Quite often in starting a set will begin to "pump," that is, the movable coils in the transformer will begin to swing, causing the current in the arc circuit to vary from one to six amperes. This not only puts a stress on the tubes but is likewise hard on the lamps, causing them to pound and wear out clutches, resulting in many "short arcs." Pumping can quite often be overcome by steadying the coils or the weight on the transformer by hand or by adjusting the dashpot; sometimes the only thing to do is to cut the set out and start it again.

Difficulties to be Met —

Under ordinary running conditions the principal trouble is due to static, "dropping out" and "spot jumping." Static is generally more in evidence at starting but in the air cooled tubes it may give trouble any time and when it does show up it is hard to correct. Static arresters are placed in each set and static dischargers, a small wire-net umbrella-shaped affair, are placed over each anode arm, espe-

cially on the oil cooled tubes. The principal trouble caused by static is burning off the anode leads of the tubes though occasionally it is the cause of a tube being totally disabled.

"Dropping out" or the breaking of the arc in the anode arms of the tubes may be caused by trouble on the outside circuit, or the tube itself may have a low vacuum. If circuit trouble, the circuit may be burned open at a drop to a lamp or else burning through a high resistance of some sort. If tube trouble there is not much else to do than to change tubes.

The cathode spot, which is the spot in the mercury chamber where the current leaves the tube, should ordinarily play in the cathode chamber and not in either of the starting anode chambers, for in the latter case the full load of 4 amperes will be carried through the secondary winding of the starting transformer, an overload for this winding unless

four months will often give them an additional life of several hundred hours. Keeping the tube inverted in a warm place or even in boiling water for a few hours has in some cases tended to prolong the useful life of the tube.

Like any other piece of electrical apparatus, a mercury arc tube with ordinary intelligent care will usually give satisfactory service providing the equipment with which it is used is in good condition, but with a careless, haphazard method of operation trouble in all its forms is sure to follow.

A HOME-MADE WIRELESS SET

(If you have a boy at home, here is a suggestion for making a home-made wireless apparatus which will delight his heart. The information is furnished by G. L. Greaves of the University of California and from W. I. Otis, Pacific Coast representative of the Thorardson Electric Manufacturing Company.—The layout of the set is given in the chart shown on the opposite page.—The Editor.)

Every boy has experimented at some time or other with a telegraph set which he rigged up himself to talk with the boy down the block. Wireless telegraphy is looked upon as a little more of a mystery, however, and usually calls up a picture of elaborate and expensive instruments which must be purchased outright with no chance of tinkering in the basement at home. Here is a suggestion of what may be done with pick-up materials by any boy with a little ingenuity.

A spark gap can be made with a block of wood into which two pails are driven. Or better still, an old battery of zinc cut in two and set in a piece of wood. The zinc is better than the nails because it keeps cooler.

A condenser can be made with an ordinary milk bottle filled with water set in a pan of water.

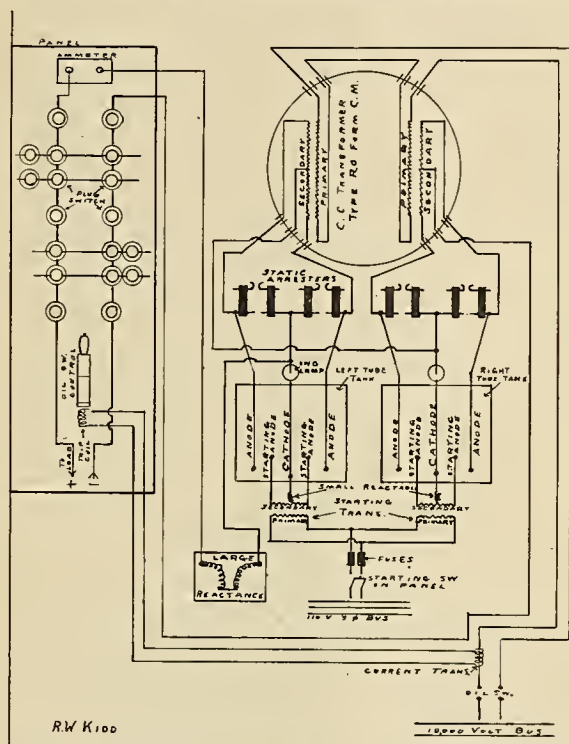
An oscillating transformer can be made by winding magnet or enamel wire around an old nail keg on which you should fix several wood strips to hold the wire away from the keg.

A receiving transformer can be made with two cardboard tubes such as calendars are mailed in, one larger than the other so that the smaller will fit inside the other; wind them with magnet wire, then fix a stick of wood on the outside lengthways so that you can put a sliding contact on it. One tube would do for very small sets but is not advisable.

A short wave condenser can be made with sheets of heavy paraffine paper or panes of glass between which put sheets of tin foil.

If you want to get the real experience and theory of wireless you should make all the above yourself, besides, it is more fun. You can buy all the wire and insulator and tape of any electric shop.

The phones are almost impossible to make and you should buy them, also the transformer if you want quite a big set, but if you want a small set on which you can send up to a mile, use $\frac{1}{2}$ inch spark coil, or a 1 inch spark coil if you want to send as far as 8 miles. You cannot very well make the coils or transformers—they are beyond most men, to say nothing of boys. The coils cost only a few dollars.

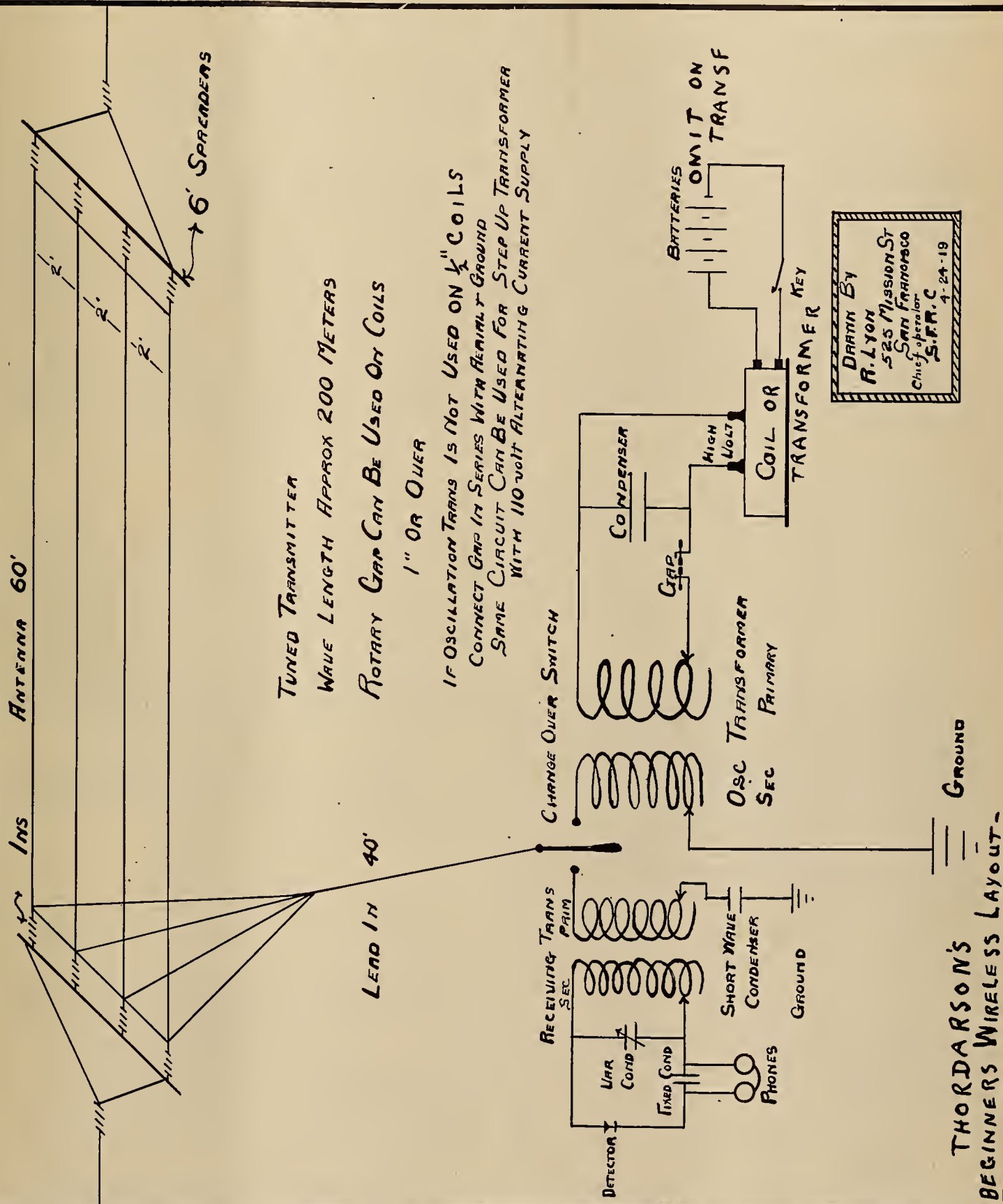


Equipment and connections of mercury arc tube rectifier sets at the Knott Substation of the Portland Railway Light & Power Company

the transformer is designed for such operation. In case the spot jumps from the cathode chamber, it can usually be put back into place by gently shaking the tube, though in obstinate cases it may be necessary to disconnect the leads from the starting anodes.

Tubes fail by puncture or by loss of vacuum. Puncture may be caused by a heavy static discharge, by a surge on the circuit, or by foreign current on the circuit. The puncture is sometimes noticeable by a small hole or a crack; sometimes the tube explodes. A tube is supposed to lose vacuum only after long operating life but in case of faulty seal around some of the connections it may lose vacuum after having been in service only a short time.

Oftentime a tube will seem to have vacuum and will appear to be all right in all respects but will not run on a circuit. For such tubes a rest of three or



BEGINNER'S WIRELESS LAYOUT

A layout for a beginner's radio set with antenna of 60 feet. Instructions as to how the various elements of the set may be made at home from materials readily obtained are given in the brief explanation on page 528. A set of this sort, of course, is not adaptable to use at any great distances, but the best way for a boy to thoroughly understand the theory of the radio is to work it out for himself—not to mention the fun of "tinkering."

Power Factor and Phase Rotation

BY LESLIE F. CURTIS

(The determination of lagging from leading currents is a simple matter with the delicate instruments of the laboratory, but the effective use of portable instruments under practical conditions is not commonly understood. The underlying mathematical calculations involved in easy and reliable methods for determining phase rotation of voltages, phase position in currents and effective power factor are here simply explained. Prof. Curtis is connected with the electrical engineering department of the University of Washington.—The Editor.)

Introduction.—All who are familiar with electrical measurements know how to obtain the power and power factor of a single-phase circuit, but not one in ten is able to distinguish leading from lagging current with ordinary portable instruments. The two-wattmeter method of measurement of polyphase power and power factor with balanced currents and voltages is also well understood, but the calculations with unbalanced load and voltages are not. Phase rotation has an important bearing upon the latter.

The object of this paper is to explain all of the above-mentioned points and to give easy and reliable laboratory methods for determining phase rotation of voltages, phase position of currents, and effective power factor.

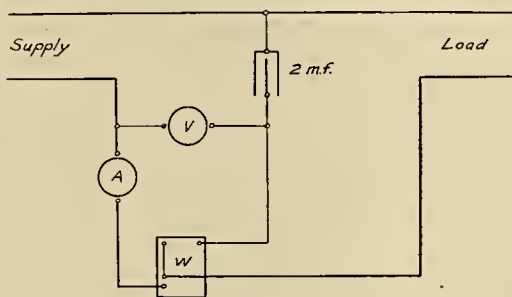


Fig. 1.

Single-Phase Power and Power Factor.—Power and power factor are readily determined by means of voltmeter, ammeter and wattmeter readings, but additional readings are necessary to show whether the current leads or lags. These may be taken with a condensance in series with the potential circuit of the wattmeter and voltmeter as shown in Fig. 1. A condenser of about 2 m.f. is suitable for meters on 150-volt circuits. Simultaneous readings of voltmeter and wattmeter must be taken. The readings and computations are:

$$\begin{aligned} \text{Power} = W_1 &= E_t I \cos \theta & \cos \theta &= \frac{W_1}{E_t I} \\ W_2 &= E_2 I \cos \Phi & \cos \Phi &= \frac{W_2}{E_2 I} \end{aligned}$$

The vector diagram for both sets of readings is given in Fig. 2. The voltage E_2 leads E_t by an angle α , where

$$\alpha = \cos^{-1} \frac{E_2}{E_t}$$

therefore

$$\Phi = \theta - \alpha$$

If θ is positive, as for a leading current, then Φ will be less than θ , although it may have a negative value. If θ is negative, as for a lagging current, then Φ will be greater than θ and will always be negative.

When the phase position is not known, it is read-

ily seen that if Φ is less than θ , the current leads, while if Φ is greater than θ , it lags.

Polyphase Power and Power Factor.—It can be proven (See "Three-Phase Power Factor," by Austin Burt, Trans. A. I. E. E., Vol. XXVI, p. 801), that the total power in any polyphase system is equal to the algebraic sum of the products of the voltages from each line to any assumed neutral whatsoever, times the components of the respective line currents in phase with these voltages.

In a similar way the reactive volt-amperes are equal to the algebraic sum of the products of the voltages to neutral and the components of the respective line currents in quadrature with these voltages.

Thus in a typical three-phase case, the vectors

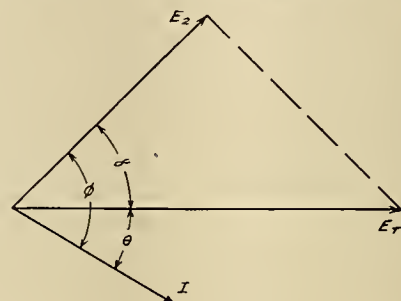


Fig. 2.

for which are given in Fig. 3, the neutral being chosen at line 3, the power is

$$P = E_{3-1} I_1 \cos \Psi_1 + E_{3-2} I_2 \cos \Psi_2$$

Obviously, when wattmeters are placed with their current coils in lines 1 and 2, and their potential coils connected between these respective lines and line 3, they will read:

$$W_1 = E_{3-1} I_1 \cos \Psi_1$$

and

$$W_2 = E_{3-2} I_2 \cos \Psi_2$$

therefore $P = W_1 + W_2$

W_1 or W_2 will be negative if Ψ_1 or Ψ_2 is greater than 90° .

Defining the effective power factor as the cosine of the angle whose tangent is the reactive volt-amperes divided by the total power, then

$$\text{P.F.} = \cos \tan^{-1} \frac{E_{3-1} I_1 \sin \Psi_1 + E_{3-2} I_2 \sin \Psi_2}{W_1 + W_2}$$

$$\text{where } \Psi_1 = \pm \cos^{-1} \frac{W_1}{E_{3-1} I_1} \text{ and } \Psi_2 = \pm \cos^{-1} \frac{W_2}{E_{3-2} I_2}$$

The reactive volt-amperes may be calculated if it is known whether the currents I_1 and I_2 lead or lag behind the voltages concerned,—in other words, whether Ψ_1 and Ψ_2 are positive or negative. This may not be determined from the two wattmeter readings since the cosine has the same algebraic sign for both positive and negative angles. To establish

these relative phase positions it is necessary to find the angles made by the same currents with other voltages of the system and the relative phase rotation of these voltages. Phase rotation may be defined as the order in which the various voltages to neutral reach a maximum. Thus the same readings of voltmeter, ammeter and wattmeter might indicate any of the positions for current I_1 , I_1' , I_1'' , or I_1''' , in Figs. 4 and 5.

In Fig. 4 the phase rotation is 1-2-3 and in Fig. 5 is 1-3-2. I_1 and I_1' indicate leading currents with

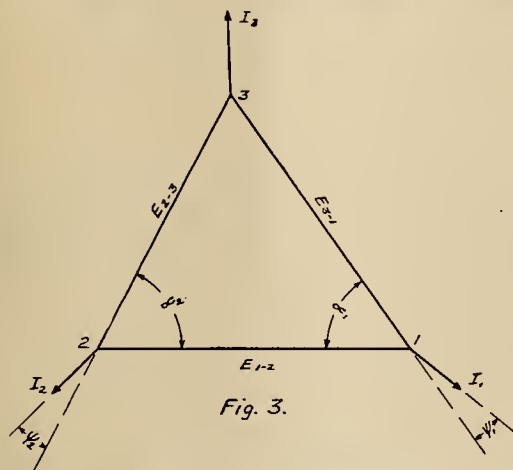


Fig. 3.

respect to the voltage E_{3-1} , and I_1'' and I_1''' lagging ones. In both Fig. 4 and Fig. 5, cosine Ψ_1 has the same value for all positions.

If each individual wattmeter is connected as in Fig. 1 for the determination of lead or lag of current, the relative direction of the wattmeter currents and voltages may be found without previously establishing the phase rotation. Thus, in a particular case, in Figs. 4 and 5, it may be found that the current in line 1 leads the voltage E_{3-1} and is either I_1 or I_1' ,

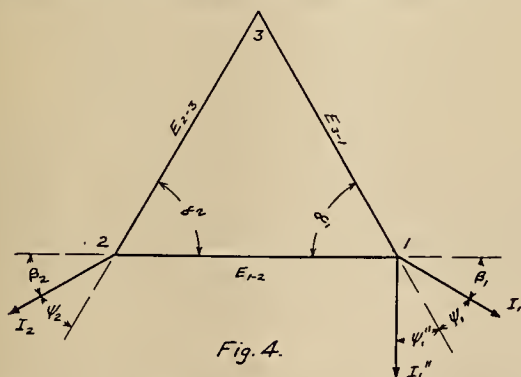


Fig. 4.

and that the current in line 2 lags behind the voltage E_{3-2} and is, therefore, either I_2 or I_2' .

In the case assumed above sine Ψ_1 and the reactive volt-amperes for line 1 will be positive while the corresponding values for line 2 will be negative. Obviously, both Fig. 4 and Fig. 5 can not be correct as the angles between the currents I_1 and I_2 and between I_1' and I_2' are not the same. In both cases, however, the calculations for power and effective power factor will be the same. There are, therefore, two different possible conditions for the same power and effective power factor in any polyphase circuit having similar voltage triangles and like values of current in two of the lines—one corresponding to clockwise and one to counter-clockwise phase rotation.

Phase Rotation.—In order to determine which of the cases in Fig 4 and Fig. 5 is correct, it is necessary to know the phase rotation. One method of checking this is to transfer the voltage taps of the wattmeters directly to lines 1 and 2 for additional readings as follows:

$$W_1' = E_{3-1} I_1 \cos \beta_1$$

$$\text{and } W_2' = E_{3-2} I_2 \cos \beta_2$$

where β_1 and β_2 are the angles between the respective line currents and the voltage E_{1-2} . The possible

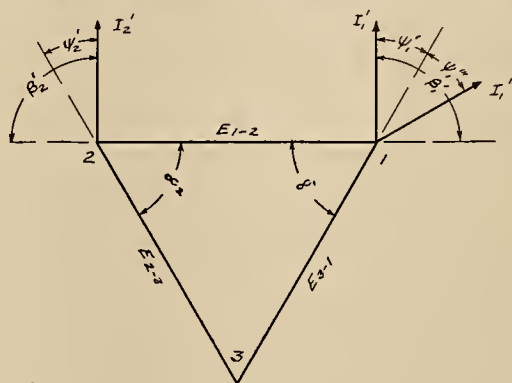


Fig. 5.

values with the cases assumed in Figs. 4 and 5 are shown as β_1 , β_2 , β_1' and β_2' .

If the phase rotation is 1-2-3, then

$$\beta_1 = \Psi_1 - \alpha_1 \text{ and } \beta_2 = \Psi_2 + \alpha_2$$

while if the phase rotation is 1-3-2, then

$$\beta_1' = \Psi_1 + \alpha_1 \text{ and } \beta_2' = \Psi_2 - \alpha_2$$

where α_1 and α_2 are the angles between the voltages as shown.

The algebraic signs for Ψ and β are positive for leading and negative for lagging current, while those for α are always positive. Only one set of the above equations will check, therefore the phase rotation will be established as 1-2-3 or 1-3-2, and Fig. 4 or Fig. 5 eliminated as incorrect.

An easier method of checking is to determine the phase rotation before taking any wattmeter readings. This may be done by adding to one line of the polyphase system a vector of known phase position with respect to one of the line voltages and reading the resultant voltages from this to all the lines. Such a vector is the drop across a resistance R in series with a condensance of reactance X (about equal to R), the two being placed in a known position between two of the lines of the polyphase system, as in Fig. 6. Voltages are read from the junction point between the resistance and reactance to all the line leads. A plot should be made as in Fig. 7 or Fig. 8 by first establishing the voltage triangle for the resistance and reactance, numbering the points on the diagram to correspond to similar points in the actual circuit. All other vectors are plotted on these established triangles as bases. Thus if the resistance is connected to line 1 and the reactance to line 2, as in Fig. 6, the voltage triangle for the points 1, 2 and 4 shows the same relative phase position irrespective of line 3, since E_{1-4} must lead E_{4-2} and E_{1-2} . E_{3-4} will, however, depend upon the phase rotation as shown in Figs. 7 and 8. If this is 1-2-3, then E_{3-4} will be large as in Fig. 7, while if it is 1-3-2, E_{3-4} will be small as in Fig. 8.

Power and Power Factor without Readings of Line Current.—With the phase rotation, line voltages and wattmeter readings W_1 , W_1' , W_2 and W_2' given, it is possible to calculate the power and effective power factor of the circuit without ammeter readings. With a phase rotation 1-2-3, the wattmeter readings will be as follows:

$$W_1 = E_{3-1} I_1 \cos \Psi_1$$

$$W_1' = E_{2-1} I_1 \cos (\Psi_1 - a_1)$$

$$W_2 = E_{3-2} I_2 \cos \Psi_2$$

$$\text{and } W_2' = E_{1-2} I_2 \cos (\Psi_2 + a_2)$$

a_1 and a_2 may be calculated by trigonometry from the voltage triangle.

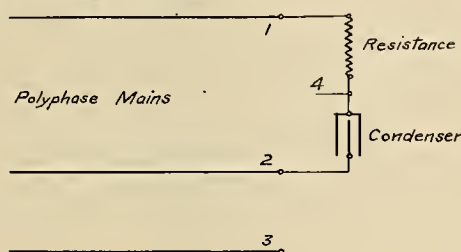


Fig. 6.

The reactive volt-amperes are

$$\begin{aligned} \text{R.V.A.} &= E_{3-1} I_1 \sin \Psi_1 + E_{3-2} I_2 \sin \Psi_2 \\ &= E_{3-1} I_1 \cos \Psi_1 \tan \Psi_1 + E_{3-2} I_2 \cos \Psi_2 \tan \Psi_2 \\ &= W_1 \tan \Psi_1 + W_2 \tan \Psi_2 \end{aligned}$$

Now

$$\begin{aligned} \frac{W_1}{W_1'} &= \frac{E_{3-1} \cos \Psi_1}{E_{2-1} \cos (\Psi_1 - a_1)} \\ \frac{W_2}{W_2'} &= \frac{E_{3-2} \cos \Psi_2}{E_{1-2} \cos (\Psi_2 + a_2)} \end{aligned}$$

Simplifying and solving for tangent Ψ_1 and tangent Ψ_2 ,

$$\begin{aligned} \tan \Psi_1 &= \frac{W_1' E_{3-1} - W_1 E_{2-1} \cos a_1}{W_1 E_{2-1} \sin a_1} \\ \tan \Psi_2 &= \frac{W_2' E_{3-2} - W_2 E_{1-2} \cos a_2}{W_2 E_{1-2} \sin a_2} \end{aligned}$$

Therefore, from the readings given, the reactive volt-amperes may be readily calculated.

The effective power factor is

$$\begin{aligned} \text{P.F.} &= \cos \tan^{-1} \frac{\text{R.V.A.}}{W_1 + W_2} \\ \text{P.F.} &= \frac{W_1 \tan \Psi_1 + W_2 \tan \Psi_2}{W_1 + W_2} \end{aligned}$$

If the line voltages are equal, the calculations are much simplified. In this case a_1 and a_2 become 60° .

Therefore

$$\tan \Psi_1 = \frac{W_1' E - .5 W_1 E}{\frac{\sqrt{3}}{2} W_1 E} = \frac{2 W_1' - W_1}{\sqrt{3} W_1}$$

and

$$\tan \Psi_2 = \frac{W_2' E - .5 W_2 E}{\frac{\sqrt{3}}{2} W_2 E} = \frac{2 W_2' - W_2}{\sqrt{3} W_2}$$

The reactive volt-amperes are

$$\begin{aligned} \text{R.V.A.} &= \frac{W_1 (2 W_1' - W_1)}{\sqrt{3} W_1} - \frac{W_2 (2 W_2' - W_2)}{\sqrt{3} W_2} \\ &= \frac{2 W_1' - 2 W_2' - W_1 + W_2}{\sqrt{3}} \end{aligned}$$

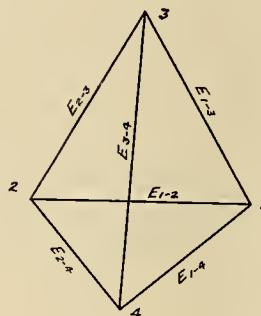


Fig. 7.

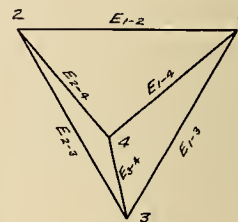


Fig. 8.

and the effective power factor is

$$\text{P.F.} = \cos \tan^{-1} \frac{2 W_1' - 2 W_2' - W_1 + W_2}{\sqrt{3} (W_1 + W_2)}$$

When the line currents are also balanced, the equations are still further simplified. In this case because of the symmetry of the vector diagram, $W_1' = W_2$ and $W_2' = W_1$.

The effective power factor is

$$\text{P.F.} = \cos \tan^{-1} \frac{\sqrt{3} (W_2 - W_1)}{W_1 + W_2}$$

If the tangent as calculated is negative, the reactance volt-amperes are also negative and the predominating current lags. For a balanced circuit the current is leading if W_2 is larger than W_1 , and is lagging for the reverse. The above discussion is for a phase rotation 1-2-3, therefore the relative magnitudes of W_1 and W_2 interchange for a reversed rotation.

Example.—The following readings were taken in the laboratory with an unbalanced three-phase supply of voltage loaded upon a star-connected set of lamp banks. No attempt was made to balance the current in the lines.

E_{2-1}	E_{3-2}	E_{3-1}	W_1	W_1'	W_2	W_2'
122.5	115.2	128.4	321.0	249.0	287.0	218.0

By trigonometry:—

$$\begin{aligned} \cos a_1 &= 0.579 & a_1 &= 54.6^\circ & \sin a_1 &= 0.815 \\ \cos a_2 &= 0.418 & a_2 &= 65.3^\circ & \sin a_2 &= 0.908 \end{aligned}$$

$$\begin{aligned} \tan \Psi_1 &= \frac{249 \times 128.4 - 321 \times 122.5 \times 0.579}{321 \times 122.5 \times 0.815} = 0.288 \\ \tan \Psi_2 &= \frac{218 \times 115.2 - 287 \times 122.5 \times 0.418}{287 \times 122.5 \times 0.908} = -0.325 \end{aligned}$$

$$\tan \theta = \frac{321 \times 0.288 - 287 \times 0.325}{321 + 287} = -0.0013$$

$$\text{P.F.} = \cos \theta = 1.000-$$

The result is to be expected since the lamp banks give a load of very nearly unity power factor.

If desired the line currents may also be calculated as follows:—

$$W_1 = E_{3-1} I_1 \cos \psi_1 \text{ and } W_2 = E_{3-2} I_2 \cos \psi_2$$

Therefore

$$I_1 = \frac{W_1}{E_{3-1} \cos \psi_1} = \frac{321}{128.4 \times 0.961} = 2.60 \text{ amperes}$$

and

$$I_2 = \frac{W_2}{E_{3-2} \cos \psi_2} = \frac{287}{115.2 \times 0.951} = 2.62 \text{ amperes}$$

From the vector diagram I_3 is approximately 3.5 amperes.

The vectors for this example are those plotted in Fig. 3.

SUPERVISING ELECTRICIAN'S EXAMINATION— PORTLAND, OREGON

Practical Questions

- (a) Make right angle bend in conduit.
(b) Make offset to fit contour of wall.
- (a) Wire in combination outlet in knob and tube work.
(b) Wire in a three-way switch in knob and tube work.
(c) Wire in a four-way switch in knob and tube work.
(d) General execution of above work.
- Make up drop cords to suit the following conditions:
 - To be installed inside of a lumber mill, in a dusty location.
 - For a combination outlet.
 - For a straight electric outlet.
 - To be installed in a garage.
- Connect up one 3 horsepower, 3-phase, 60 cycle, squirrel cage induction motor, to conform to the requirements of the City Electrical Code.
- Connect up a compound wound motor.

Problems — 20 Points

- What size of rubber covered wire in conduit, must be used to conform with the requirements of the Electrical Code of the City of Portland, with an allowable drop to the farthest lamp of two volts, load consisting of 100 incandescent lamps and a 20 ampere heater. Lamps taking one ampere each, distance 100 feet on a single phase, two wire system.
- Calculate the size of rubber covered wires to be used for the following motors, to comply with the Electrical Code:
 - 1 25-h.p. direct current, 550 volt motor, with an efficiency of 50%.
 - 1 25-h.p. squirrel cage type, constant speed, induction motor, 440 volts, 3-phase, 60 cycle, efficiency 50%.
- Determine the "Load Center" for the following loads, giving the value in amperes and distance.

100 amperes at a distance of	80 feet
40 amperes at a distance of	100 feet
20 amperes at a distance of	130 feet
- (a). Given the resistance in a d.c. 2-wire circuit and the voltage, how do you find the current?
(b). If the resistance of a circuit equals 100 ohms and the current equals 50 amperes, what is the voltage?

- If a three wire 110-220 volt, d.c. system with 100 ½-ampere incandescent lamps between neutral and the positive side and 60 ½-ampere incandescent lamps between neutral and the negative side and a 25-ampere d.c. 220 volt motor between the negative and positive sides, how many amperes are flowing in the neutral when all the load is in operation? Show by diagram also.

City of Portland Electrical Code

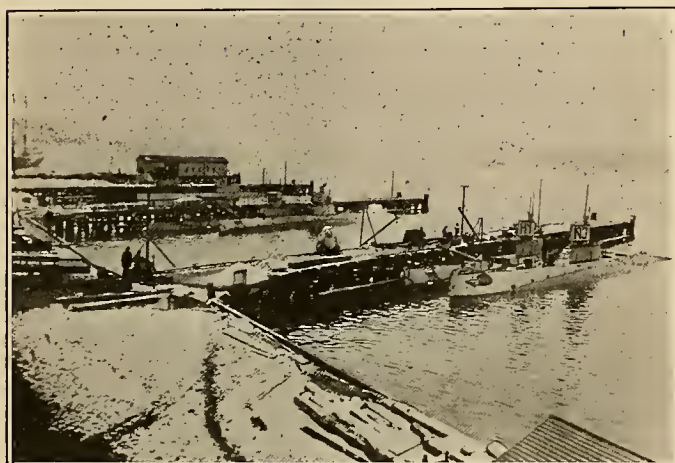
- (a). Under the requirements of the City of Portland's Electrical Code what is necessary to be obtained, before an electrical installation is installed, changed or repaired?
(b). If the cost of the work does not exceed \$5.00, what is the amount of the fee?
(c). What is the penalty if an electrical installation is commenced without carrying out the requirements of the Code?
(d). What is the maximum penalty for the violation of the City Electrical Code?
- Draw and properly mark the following wiring symbols:

(a) Ceiling outlet	(b) Wall receptacle	(c) Floor outlet
(d) Drop cord outlet	(e) Three way switch outlet	(f) Motor control outlet
(g) Ceiling fan outlet	(h) Bracket outlet	
- For roughing in wiring for interior construction where new wiring installations are to be made, what are the Code requirements as regards wattage to be provided for in each of the following cases:
 - Minimum wattage for floor, flush and wall receptacle outlets in all classes of buildings.
 - Minimum circuit capacity to be provided for ceiling outlets (other than beam lights) in dwellings, flats and apartments of five rooms or less, in parlors, living rooms, dining rooms, libraries and dens?
- Specify two locations where twin wires may be used and conform to the Code.
- (a) Specify the distance between wires for open work in dry places for a voltage of 0 to 300.
(b) Specify the distance from surface wired over for open work in dry places for a voltage of 0 to 300.
- (a) Is there any place where soft wood moulding may be used under this code in the City of Portland?
(b) What is the voltage limitation for the use of moulding?
(c) What covering must wire have when used in moulding?
(d) What is the wattage limitation in regard to circuit capacity in moulding?
- (a) How many braids must a single rubber covered wire of No. 8 B. & S. gage, have, to make it comply with the requirements for a conduit installation?
(b) Where may wires in a conduit system be spliced?
(c) How many two wire circuits without special permission may be placed in the same iron conduit, leaving out of consideration stage pockets and border circuits?
(d) Why does the Code require all the wires of the same circuit for alternating current placed in the same iron conduit?
- State whether or not flexible cord may be placed on knobs or cleats.
- What kind of base sockets or receptacles must a 500 watt "gas filled" incandescent lamp be installed in?
- When a theatre obtains service from a Public Service company, what must be furnished to conform to the Code as regards the main service and emergency service for the lighting system?

Trailing an Enemy's Submarine

(The scientific miracles of the war leak out only by degrees. Here is an account of one directed against the submarine—that hidden enemy whose fearful effectiveness lay in the fact that it could strike without warning and escape without fear of discovery. The remarkable results recorded here were the product of the combined laboratories of the General Electric Company, Submarine Signal Company, Western Electric Company and the National Research Council.—The Editor.)

The United States Navy Department, after nearly two years of the closest censorship, has given approval to the publication of certain data relating to the development in the United States during the war, of submarine detecting devices which were used to signal advantage by this country and the Allies



Submarine Base, New London, Conn., where the National Research Council and naval engineers developed and experimented with submarine detecting devices. This was the headquarters of the "New London Group." The picture is copyrighted by the International Film Service Company, Inc.

in bringing to a successful conclusion the campaign against the German U-boat.

The apparatus may be termed the composite work of the General Electric Company, Submarine Signal Company, Western Electric Company, the National Research Council, assisted and advised by many eminent scientists, engineers and research men, chief among whom were Drs. W. R. Whitney, Irving Langmuir, and W. D. Coolidge, Prof. R. A. Milikan, Prof. Max Mason, etc.

At the suggestion of Dr. Whitney, director of the General Electric Company's research laboratories, a group of scientists was formed at Nahant, Mass., under Dr. Irving Langmuir, where the results of extensive research activity were put to practical tests under conditions as nearly as possible approaching those in European waters.

Another group under Prof. Milikan, head of the Physics Department of the University of Chicago, was appointed at New London, Conn., where the work of both bodies was later coordinated.

Out of the efforts of these two groups and the work carried on in Schenectady, assisted by Allied commissions of scientific men, there grew the American Submarine Detector—a development of the old principles of sound wave transmission in water in an altogether new and startling manner.

The Principle of the Detector

The apparatus was first designed to hang overhead from naval craft, amidship below the water

line, and it depended for its direction-getting qualities on the peculiar and heretofore little understood faculty of the human ear to detect the direction of sound by the shifting of that sound from one ear to the other.

To overcome the obstacle of interference of sounds made by the listening ship's own motors, another device was developed which could be trailed off the stern a hundred or so feet away where the engine noises of the ship were out of range, and the sound was then brought in to the operator in the ship's hold. A third adaptation of the listening principle was an instrument which protruded through the hull and was a stationary part of the vessel's equipment.

Attached to Airplanes as Well

While demonstrating the device to the British Admiralty, our American engineers were asked to



Sailor listening for enemy craft. The principle of the device is virtually that of extending the distance between the ears of the listener by plates on either side of the ship, so that an appreciable length of time is required for sound to travel from one side to the other.

study the question of fitting submarine detection units to airplanes, balloons, and dirigibles.

After some experimentation, followed by more practical tests and conferences with the Lancashire group of scientists at Harwich, apparatus was developed which met these needs, and many aircraft were equipped with sound detectors which rendered it possible for them to follow the course of the enemy after they had seen her submerge, a valuable faculty which such craft did not possess until the introduction of the American detector.

When the devices had proved themselves eminently satisfactory after exhaustive experimentation here, the Navy Department organized a special Service Party under Capt. R. H. Leigh, of the Bureau of Steam Engineering, to demonstrate the detectors to the British Admiralty. Shortly after the arrival of this party abroad, the American submarine detectors were universally adopted by all the Allied navies.

The Operation of the Device

Under ideal conditions with extraneous noises

reduced to a minimum or entirely eliminated, the device was effective at a range of 15 to 25 miles, and under average circumstances, at a range of between 3 and 8 miles.

Trained operators could clearly distinguish between the sounds made by approaching surface craft and under-water vessels (submarines).

Within five miles the engine characteristics of different vessels were clearly marked, even to the point of identifying by name certain unseen vessels after they had been observed previously for more

Evidently the first depth charge had taken good effect and the enemy's crew were making a last desperate effort to reach the surface. Then there was a dead silence, broken at last by 25 sharp reports like revolver shots. The crew, giving up in despair, had committed suicide. The loss of this submarine was later substantiated by the British Intelligence Department.

On New Year's Day, 1918, Capt. Leigh and his party went out in the English Channel with three trawlers, equipped with the submarine detecting apparatus. A wireless message was picked up from an airship giving the position of a submarine which had just been seen to submerge. The channel had been laid out in numbered squares to facilitate the immediate location of enemy craft, and the little squadron steamed over, got their devices out and picked up the submarine course.

When believing themselves about over the enemy, they discharged depth bombs, and later a trawling instrument was used which indicated that the submarine had been destroyed. Great quantities of oil rising to the surface also substantiated the success of the attack.

After some months another squadron was equipped and sent into the Mediterranean and Adriatic, where at this time submarine activity was at its height.

A Well Directed Bomb

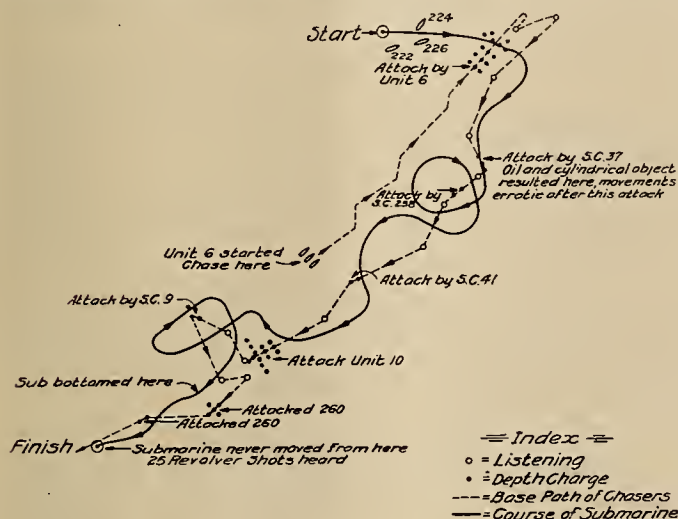
Three of the chasers patrolling in formation abreast one dark night heard a submarine approaching. The bearings obtained by the two beam vessels pointed directly toward the center boat. The middle boat now heard the submarine approaching from a position dead astern. The enemy came nearer and nearer and finally passed right under the chaser, so close to the surface that those on board felt a wave of water along the keel of their ship.

When the German had passed on and out in front, the attack was made in unison, a pattern of bombs was "let go" and the little fleet halted for further observations. Pretty soon the whirl of the submarine electric motors was heard, evidently in an effort to reach the surface.

Then came a crunching noise, not unlike the popping in of a blown-up paper bag. It was apparent that the submarine had been damaged and put out of control, and that she had collapsed from the tremendous water pressure at these depths.

Many incidents of this kind occurred during the subsequent operations in foreign waters and several submarines were accounted for through the direct aid of the American listening devices. In fact, naval experts state with conviction that if the conflict had continued through another summer, the submarine would literally have been driven from the ocean.

It has also been stated that the noticeable change in naval tactics—from defensive to offensive—which marked this country's entrance into the war, was largely caused by the application of American principles to the pursuit and attack of the U-boat, something made possible by the practical use to which the American submarine detector could be put.



Plot of Operations Sept. 6, 1918
Units 6 and 10

Chart showing operations against German U-boat, Sept. 6, 1918, based on official data collected by naval officers during the actual engagement. From a photo by the General Electric Company.

than one time. The direction of sound could usually be computed within a very few degrees of its actual location and a good judgment of the distance could generally be made.

It was found practical to tell when a submarine changed from her oil engines to electrical drive, which was necessary every time she submerged.

The addition of these listening devices to submarines added the heretofore lacking sense of hearing to all the under-water craft, and made them at once a much more effective weapon of offense.

The Story of the Chase

An Allied submarine on one occasion chased a German U-boat for four hours, while both craft were submerged, without once losing sound contact with the enemy.

The engagement which is illustrated occurred early one morning in the English Channel. A small squadron of chasers discovered an enemy craft moving slowly up the channel submerged. Forming for the attack, they rushed over the spot where their listeners indicated the U-boat to be, dropped a pattern of depth bombs and then withdrew to take observations.

Feverish activity and the sound of hammers ringing against the ship's side was heard. The submarine engines would then start up and stop, start and stop again.

Further attacks were delivered and more noise came to the listeners from the hold of the submarine.

DEFINING SALESMANSHIP

BY R. M. ALVORD

(A discussion of H. L. Harper's paper on "Selling the Idea," which carries the thought into the principles of salesmanship. A sample of the type of ethics which forms a solid foundation for business success.—The Editor.)

Mr. Harper says: "Salesmanship consists of selling persons what they want and magnifying their wants in such a way that they simply cannot get along without them."

The definition which I like to use may not be more correct technically, but it does, I believe, help to give a broader understanding of this great art: "Salesmanship is the art of selling 'Service,' or 'Merchandise and Service,' at a profit to the seller and to the benefit and lasting satisfaction of the purchaser."

According to present business standards no exchange is considered a true sale unless the goods and service benefit the purchaser in full measure for the price paid and also prove continuously satisfactory.

The true salesman is therefore the one who selects for prospects those persons who will be greatly benefited by his goods and service.

It has been said that a salesman must be enthusiastic if he is to succeed. It is also true that not the spasmodic, effervescent kind, but the steady every-day enthusiasm built on a thorough knowledge of the goods, is the enthusiasm that brings results.

Selling Service

A salesman having studied carefully the material and construction of his goods will become convinced of the high quality of them and be enthusiastic in presenting the story to his prospects. He may or may not secure the order. He is enthusiastic about only a part—the second part of his goods. The first and most important part is the use that they can be to his prospect. If our salesman learns by experience or otherwise of the service that the goods will give—how they will help the housewife, the farmer, the merchant, or others—he will tell that part of the story first and so convincingly that the prospect cannot help but recognize his or her need of that service. Then the order is assured. It's the service they will need and want, not the device or goods.

Trying It on the Dog

And although a knowledge of the goods is important and should be included in the equipment of every salesman, the importance of selling "Service" is still greater, as is well illustrated by a story which I read several years ago:

A man living in a city owned a high grade pedigreed dog. It had won many prizes at dog shows. It was necessary for the man to leave that section of the country so he decided to sell his dog, preferably to some farmer who would take good care of him.

He went out into the country and among others met an old farmer who was getting along in years, was bothered some by rheumatism, and whose place was infested with rats. He told the farmer all about his dog, pointed out the beautiful markings and the dog's coat of fur, showed him all the points which won prizes at the shows, told him of the dog's history and pedigree, and enthusiastically went into

much detail regarding the many superior points of this pet dog.

When he had finished he received from the farmer this response: "Don't want no dog."

Having been unsuccessful in his attempt to place the dog prior to the time of his leaving, he left the dog in the hands of a friend who was to endeavor to make the desired sale. This friend was a man who had had some experience on the farm in his younger days and knew something of the farmer's problems. He also knew that in addition to the superior technical points this particular dog, by nature, was a good cattle dog and a good "ratter."

On his first trip to the country with the dog it so happened that he fell in with this same old farmer who had trouble with rheumatism and rats. After engaging him in conversation he first inquired if it was not difficult in his older days to go out and bring in the cows at night. The old farmer agreed that it was, that he was not as young as he used to be, and that his rheumatism bothered him.

Our friend then inquired if the farmer was in any way bothered by rats and was told that the place was simply infested with them, and that it was hard to preserve grain and food anywhere around the place.

Our friend then inquired if the farmer had any means of protection at night, and was told that he had not and would be very glad if he had some means of keeping away the prowlers.

Our friend then said, "I have a friend who owns a dog that drives cattle, can be sent after the cows at night, that will bring them in, and that will keep the place clear of rats and similar pests, and that will arouse the house by barking if anyone comes around to disturb the place at night."

The old farmer quickly exclaimed, "Where in the world can I get such a dog?"

Putting It into Practice

I have seen enthusiastic salesmen fail, simply because the service to be secured from the goods was not included in the foundation of their enthusiasm. I have seen others win success without a thorough understanding of the construction of the goods simply because they had a full knowledge of the service which the goods would give and presented their story with a convincing enthusiasm that was created by a desire to serve and the knowledge that the goods would serve.

Mr. Harper states that this idea presented in his paper is not new. That is true. But while many have heard or read of this idea, but few seem to have applied the principle to their own work. The need for its universal use in our industry is great and fully warrants the time and thought given to it by Mr. Harper, by the Commercial Committee and by this convention.

The problem before us, therefore, is to find ways and means of causing everyone in the sales end of our industry to know all about the real benefits to be derived from the use of electrical devices and to use this knowledge for their main sales talk.

Use Them Yourself

Experience is probably the best teacher and will bring great results in enthusing our sales people with a full realization of the service to be secured from the use of various electrical devices. It is therefore important that every effort be made to encourage a greater use, by the men and women of our industry, of the electrical labor saving devices which we desire to sell to the public.

And then there is another and, I believe, a greater influence which can be made to aid us.

It has seemed to me that men and women of ability who think "service, not self" are the ones who make the greatest real success in this world of

ours. Because of their desire to serve they naturally use their ability to render the very best possible service in their particular line.

The Rewards

Such service brings two profits—the physical or financial, and the spiritual, or the satisfaction and joy in work and service well done. The broad-minded, successful man understands that the exchange of his goods, his service and his ideas for profit is legitimate and ethical, provided that all parties to the exchange are benefited thereby. And he also realizes that financial profit is necessary to develop himself and those dependent upon him—physically, mentally and spiritually, in order that he may continue to improve his service. He knows, too, that profit is needed in order that his business organization and equipment may make progress in executing his ideas of service for the benefit of the public. He thus becomes a living demonstration of that fundamental truth—"He profits most who serves best."

Will it not, then, largely accomplish our objective if we awaken within the men and women of our industry the full realization that their task and ours is to well serve the public—our fellow creatures—and that our success individually and collectively is measured by that service? Arouse that desire to serve which, though stronger and more developed in some, is inherent in nearly everyone, and we will naturally and convincingly think and talk of our goods in terms of the service which they will render to the purchaser. We will then sell more goods—resulting in greater benefits to the public and in a larger profit compensation for each of us.

GROUPING GOODS FOR DISPLAY

BY ROBERT FALCONER

(Do you carry your washing machines near your electric irons? Here is a suggestion which applies the lessons of the furniture store to the electrical business.—The Editor.)

Furniture — Not Groceries

For many years furniture dealers have found it very effective to arrange displays of furniture in little booths representing the different rooms of the house. Each of these rooms is fully furnished. There is no confusion. When a person finds it very difficult to make selections from the general stock all becomes simple and easy here. All that is necessary is to buy everything that is shown in the booth.

As a matter of fact, people usually do buy more when they see displays of this type than they do when selecting from a general stock. There is no confusion. One can see just how the furniture is going to look in the home. There are articles displayed that would be overlooked and forgotten if they had not been suggested by this display.

Electrical appliances can be displayed in exactly the same way. To secure good results booths are not necessary. Simply grouping by uses will serve the purpose very well. Instead of laying out the sales floor with counters, show cases, and tables in

the regulation manner of a grocery store, divide it up into spaces for group displays.

Dividing the Floor Space

Have a space for kitchen appliances, another for laundry appliances, another for nursery appliances, and so on for all the other kinds of rooms and uses in the home. Have an office section, a factory section and sections for all the other lines catered to by the business. The size of the store occupied and the line of goods will determine to a very great extent to how great a length this idea can be carried out. Confined floor space, for example, might necessitate the combining of the kitchen and the laundry groups, of the bedroom and nursery groups, etc. Regardless of the smallness of the space or of the stock, however, it will pay to carry out this general idea.

This is no new idea. It is not the product of a wild imagination. It is an idea that has been used by successful merchants for many, many years. It is now coming into more universal use. It is merely adapting the principles that make a painting sell, a book sell, or a piece of music sell, to the grouping of merchandise for sale. It is merely applying some of the principles of art to the selling of merchandise.

A FOREIGN MARKET AT HOME

While American manufacturers are straining every nerve to build up a foreign trade for their goods, there is a foreign market at our doors which has hardly been touched. No doubt, just because it is so near at hand, it has been ignored, and its possibilities overlooked.

If it is profitable to spend hundreds of thousands of dollars and to send skilled "trade missionaries" to the Old World in order to educate the natives to American ways and American products, why would it not be quite as profitable to teach the thrifty foreigners in America to demand standard American goods and to live in American style?

There are in America 15 million foreign born, or including those of foreign parentage there are 33 million buyers of American goods. But a large proportion of them are not buying more than they have to, because they prefer the familiar wares from their own countries. Many of them do not know about American goods or how to use them. Another reason that they are not buying more is that they have the habit of hoarding their savings to send abroad, denying themselves every comfort while in America so that they can live in grand style later on in the Old World.

It has been stated that \$1,500,000,000 are held by foreigners at present, awaiting transmission to Europe as soon as the bars are let down.

Foreigners are making good wages, but have little inclination to spend them. The time is ripe for an educational campaign to encourage them to live in American style, to teach them about American goods, in short, to make these thrifty and prosperous people good customers for our products.

The Business Library

BY LOUISE B. KRAUSE

(The problem of bringing articles of importance which appear in technical periodicals to the attention of those who should see them is one of the major duties of a business librarian. Here are suggested methods of thus making the best use of current numbers, as well as practices of filing and preserving the collected issues for future reference. The author is well known as librarian for H. M. Byllesby & Company of Chicago. Attention is called to the fact that these articles are copyrighted.—The Editor.)

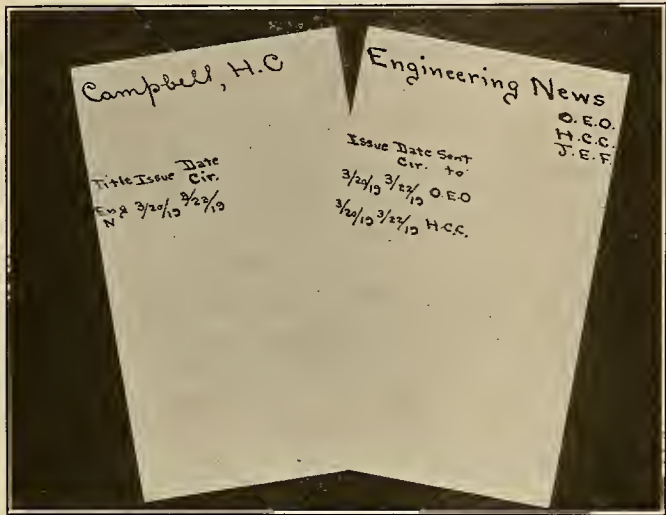
PERIODICALS IN THE BUSINESS LIBRARY—HOW TO USE AND HOW TO FILE THEM

The Circulation of Periodicals

After the periodicals have been read and subject indexed by the librarian, as necessity requires, and this should be done immediately on mail delivery, they are sent to the desks of the members of the organization who are most vitally interested in any special information which they contain. Methods of

The periodical gets laid aside on some one's desk and the librarian does not know whether it is being passed along promptly or not, whereas if the periodical is sent direct to one individual and is not promptly returned, the librarian goes after it, if it is important that it should go to someone else in the organization, without unreasonable delay.

A simple loan record on 3 by 5 inch cards specially ruled and of which illustrations are shown, should be kept under the name of the man to whom the periodical is sent, and also under the name of the periodical, in order that the librarian can tell on a moment's notice where any issue of a periodical is and also what each man has charged against him. The same kind of a charging record can be used also for recording books which are loaned. The business library is not concerned with any time limit for loans, except in types of business libraries which maintain circulating collections for employees.

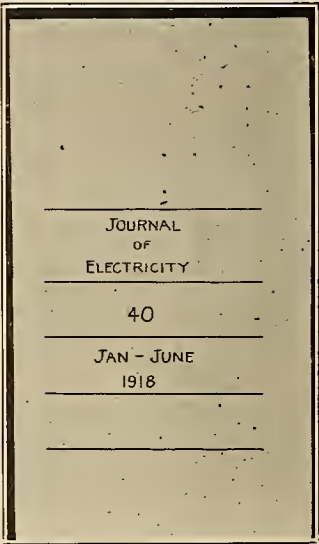


LIBRARIAN'S LOAN RECORD

In order to keep track of periodicals and see that they reach everyone who should see them, the librarian keeps a loan record both of the movements of the periodical and of what matter is in the hands of each individual.

circulation vary in different types of business libraries; some business libraries which serve a large constituency prefer to make typewritten or mimeographed lists of subject references to articles in the periodicals received during the week, and circulate these lists throughout the organization, asking the men to send to the library for any article they desire to read. This method does not suit busy executives who have no time to read a list and make a selection, and who wish the material itself put in front of them.

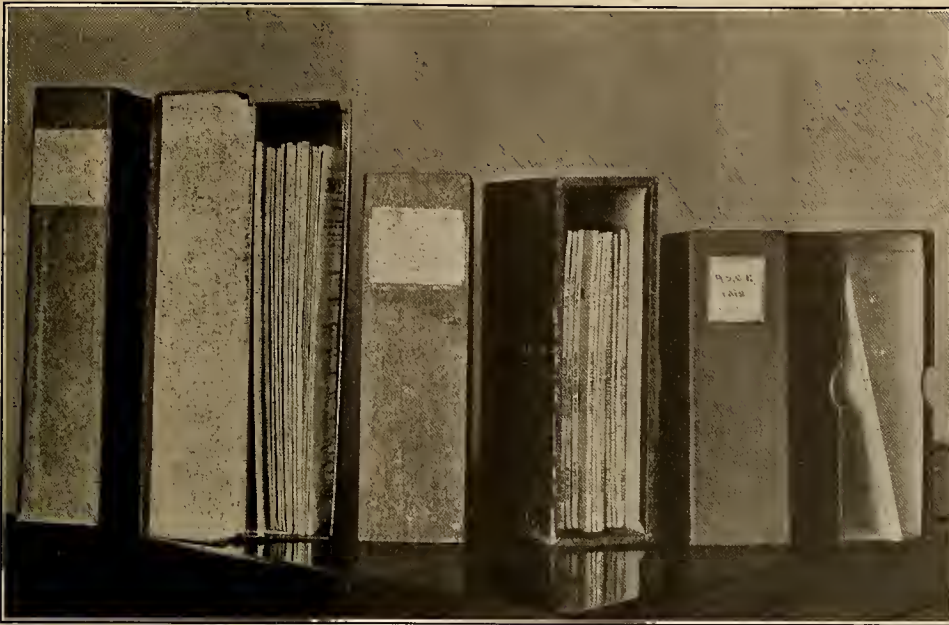
Some business librarians route their periodicals, attaching a slip with a list of names indicating the next person to whom the periodical is to be sent, when a reader is finished with it. Other business librarians send the individual periodicals direct to one man only, with a slip calling his attention to the article of special interest to him. As soon as he is through with the periodical, he puts it in his outgoing basket and it is returned to the librarian, who sends it to a second man, with a special note of the contents for him. This method seems much more desirable than to route periodicals, because they most often fail to route—they simply side track!



Periodicals should be bound in order that the valuable data be available for reference. Clipping is both cumbersome and often fails to foresee special needs which may arise. The correct position and style for lettering the backs of bound volumes is here shown.

The Binding and Filing of Periodicals

After the current periodicals have made their last tour of the offices they come back to the library to be filed for future use. What disposition shall be made of them? Shall important articles be clipped and filed and the remainder of the periodical thrown away, or shall a complete file be kept for six months or a year and then thrown away, or shall files be kept complete and bound for permanent books of reference? The latter method represents the best library practice for the following reasons. No business organization or business librarian is prophetic enough to foresee exactly what information will be useful to keep in a business library for future use, when one considers the variety of valuable material found each week in the periodicals, which cover the activities of a certain line of business. Complete



The best method of preserving current numbers is by the use of pamphlet boxes which come in a variety of dimensions. These take up a small space on the shelf and preserve in good shape the copies of such periodicals as are to be reserved for binding.

files of bound periodicals constitute one of the most valuable reference aids that any business library can possess. Clipping valuable periodicals might in some instances be compared to cutting out an article from a valuable encyclopedia.

Miss Maude A. Carabin, Librarian, Detroit Edison Company, says:

"I seriously disfavor the practice of clipping periodicals as being faulty economy. If you count the energy and cost and annoyance necessary to put them into fit condition for filing, indicating their source and date, and classifying them for filing, and counter-balance the method of treating which entails only the assignment of a subject to the articles, the typing of a subject card to be placed in the library catalog, and affording shelving space for the journal, the latter method recommends itself as superior in compactness, orderliness and

general satisfaction. To be sure, the shelves will ultimately become overcrowded, but the time soon comes when by reason of its age much of this material loses all but its historical value and it can be disposed of by gift to the public libraries, where desirable, and yet be available. To clip an article from its setting is to practically devitalize it, and invariably if a clipping appeals to a patron, he will ask, 'Can you get me the journal from which this was taken?' Furthermore, the existence of the articles is insured permanence in the library catalog, even though the journal containing the article is destroyed, for it is nearly always possible to secure copies of reproductions from the larger public and technical libraries. On the other hand, if the clipped article is inadvertently destroyed or misfiled, its identity is lost, as well as the labor which has gone to making it 'filable.'"

One of the values of having periodicals bound is that they do not get lost or misplaced or carried off so readily, as a separate number or a clipping would. Bound volumes do not take up so much space as might at first thought be imagined, for a three-foot shelf will hold the bound volume of the larger size periodicals for a six or seven years period, and the number of worth while periodicals devoted to any one industry (excluding of course the annual volumes of societies) are comparatively few, and twelve to fifteen sets would be the maximum for any one business library.

The replacing immediately of a lost or mutilated periodical is one of the important duties of the business librarian, for it is reasonably sure that the lost or mutilated number has something of real importance in it, else it would not have been so treated by any member of the organization; it is also important to replace it as soon as possible, because often back numbers are difficult to obtain.

Business men as a rule know nothing of the principles of satisfactory binding and generally give the work to commercial printing establishments who misplace pages and sections, and make mistakes in titles and volume numbers in lettering the backs. If a business house does not have a librarian to supervise its binding, it should be careful to select if possible a bindery which specializes in library binding and will do the work in accordance with the best library practice. An illustration is shown of correct position and style for lettering the backs of bound volumes.



A corner of bound periodicals in the library of H. M. Bylesby & Company, Chicago. The worth while periodicals devoted to any one industry are comparatively few and bound volumes do not take up so much space as might be imagined. A three foot shelf will cover six or seven years of one periodical.

It is not advisable to bind the volumes of every periodical received, for many are only of passing interest, and while it is advisable to keep such an unbound file for a year or two, at the end of that time the librarian will be guided by his experience and use discretion in disposing of out of date material.

The best method of preserving the current numbers of periodicals which are to be permanently



File boxes used by the library of the National Safety Council, Chicago, for current circulars for distribution to their members

bound or preserved without binding is by the use of Library Bureau pamphlet boxes, or similar makes, made in a variety of dimensions.

The "L. B. pamphlet box" is made of heavy chip-board covered with glazed paper or black cloth, and half of one side doubles back on itself permitting of easy consultation without removal of the contents. These boxes stand on edge like books and are dust tight.

"Wood C. C. pamphlet case" is made of seasoned wood and covered with durable paper. This case has a closed top and open back and is therefore not dust proof and has to be taken off the shelf to consult the contents. For general use the L. B. pamphlet box is preferable for business library work. Some business libraries also use a specially made box of heavy cardboard covered with book cloth and with a card label holder on back, similar in style to the "Wood C. C. pamphlet case," and which can be made by any good paper box factory, at prices ranging from fifteen to twenty cents each on quantities, according to the size desired. H. Schultz and Company, 519 West Superior Street, Chicago, Illinois, advertise quotations on stock of this kind.

The Clipping of Periodicals

Clipping may be legitimately indulged in, when an article of interest is found in a single number of a periodical, to which the library does not subscribe. Newspaper items, of course, must always be clipped and there will always be material like printed leaflets which will require the same kind of filing as clippings.

Clippings are best filed in vertical file units, and methods of filing and indexing will be discussed in a subsequent article. The "U-File-M" binder strips manufactured by the U-File-M Manufacturing Co., Syracuse, New York, are exceedingly useful and satisfactory for fastening clippings, single sheets or thin booklets into vertical file folders. These strips need to be visualized by samples in order to clearly understand how they work, but they can be described in general as gummed strips a half-inch in width and 11 inches long with forty-four gummed tabs one-eighth of an inch wide affixed, which can be pulled out from under a protecting strip with the finger nail. The eleven-inch strip or any cut off portion, can be glued horizontally or vertically into a folder and papers or clippings attached by the gummed tabs.

Business firms who wish to keep up with any special information appearing in the daily press often employ a press clipping bureau. Such service always furnishes quantity rather than quality, as no attempt is made to select only items of real value. For example, a firm specializing in the manufacture of canned milk ordered a clipping bureau to send it all newspaper clippings on milk and among the clippings sent was one of a milkman arrested for speeding, and similar clippings were frequently sent. If very special information from the daily press is desired the clipping should be done by a person within the organization who has intimate knowledge both of the subject and of the need.

HAVE THE BRIGHTEST STORE ON YOUR STREET

Your store should be the brightest one on the street, suggests the Hardware World—that's one mighty good way to advertise. The way to do it is to keep your windows the cleanest. This is one way to do it:

Let one person clean them at all times. Make it his own job. Hold him responsible.

The inside of the windows should be washed with tepid water applied by means of a chamois skin, using no soap or powder of any kind. Dry with a chamois and polish with cheesecloth. The outside requires different treatment, however. It should be cleaned with the following mixture:

One ounce pulverized whiting; one ounce grain alcohol; one ounce liquid ammonia; one pint water.

Apply with a soft cloth, after having sprayed the window to remove the surface dirt. When this preparation is allowed to dry and is then rubbed off with a polishing motion, the surface of the window will be extremely brilliant and will remain so for longer than when washed in the ordinary way.

If the window has become badly scratched, a filler should be applied, consisting of an ounce of white wax dissolved in a pint of pure turpentine. This fills the cracks or scratches and prevents dirt lodging in them.

A show window thus treated will appear much brighter in the day time than a window washed in the usual way, while, if properly illuminated at night, it will stand out prominently among the ordinary show windows along your street.

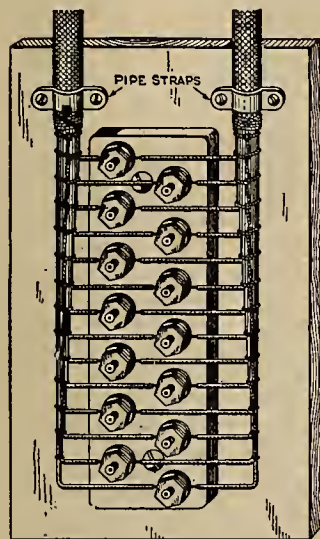
PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(Do you understand why wire of certain dimensions must be used for a given current? Why a too heavy load of household appliances used on a circuit intended purely for lighting is not desirable? Do your customers understand enough electricity to appreciate the reasons why? Here is a course on practical electricity given by the Journal of Electricity in conjunction with the extension departments of the Universities of California and Oregon which provides just such information.—The Editor.)

WIRE CALCULATIONS

Wires used to carry electricity are usually of copper, aluminum or iron. In the United States copper and aluminum wires are made in various sizes according to an arbitrary set of dimensions known as the "Brown & Sharpe (or American Standard) Wire Gage." A wire known as No. 5, for example, has a diameter of .1819 inch, and No. 10 has a diameter



Here is a connecting block for an interior telephone system. If each wire is No. 18, what is the resistance of 200 feet of the cable if all the wires are connected together at each end?

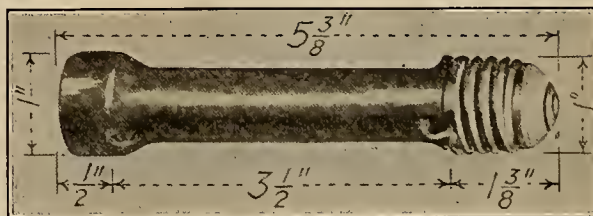
Connecting block with staggered terminal posts—Fig. 1

of .1019 inch. The largest size in this gage is No. 0000, the next is No. 000, then 00, then 0, then Numbers 1 to 40, of which the last is the smallest wire (.00315 inch diameter).

It is customary to express the diameter in "mils" (one mil = .001 inch) rather than in inches. Then No. 5 wire is 181.9 mils thick, and No. 10 is 101.9 mils thick. The cross section area of a wire can not be expressed conveniently in square inches; it is found preferable to use, instead, the "circular mil" (c.m.) as a unit. For wires and cables larger than No. 0000 the size is designated by their circular mil area. The diameter of a solid wire is found by taking the square root of its c.m. area: When the diameter is known, the c.m. area is found by squaring the number of mils in the diameter.

Wire tables are found in all electricians' text books and hand books. From these one can quickly determine the characteristics of copper wire of any size. The tables differ somewhat in arrangement, but practically all of them give the diameter and the section area for each numbered size, together with the resistance and the weight of 1000 feet of wire. The partial table below gives figures for a few sizes according to the scheme adopted in the University Extension technical courses.

If one knows that the resistance of one foot of 36 wire is .414 ohm, it is easy to compute the resistance of any length. Six feet, for instance, will have $6 \times .414$ or 2.484 ohms, for we have six resistances of .414 ohm each connected in series. Then the



For replacing carbon lamps in "lamp banks" used as rheostats, these resistor units are being used. This particular one absorbs 60 watts at 120 volts. What length of No. 36 copper wire has an equal resistance? What length of No. 36 nichrome?

resistance of 220 feet of No. 18 copper wire is 220 times $1/1000$ of 6.374 (see table), for 6.374 ohms is the resistance of 1000 feet.

The weight of any length of bare wire is figured in exactly the same way from the tabulated figures of the lbs. per thousand feet. Manufacturers and dealers supply with price lists tables of the weights of wires insulated in various ways.

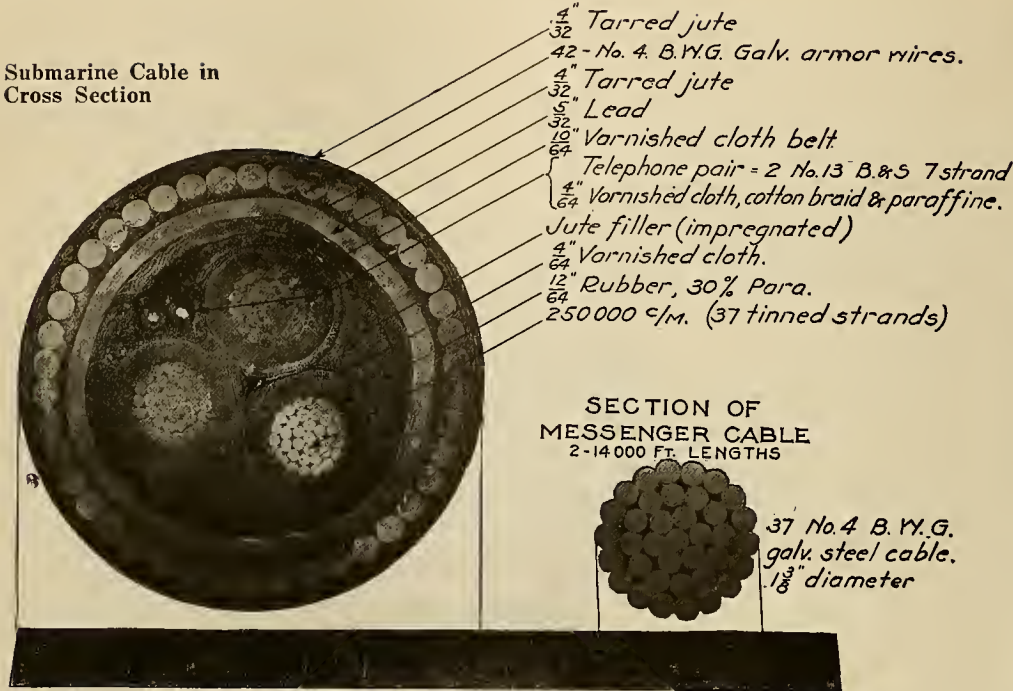
In the table below the resistances are given for a temperature of 68° Fahrenheit. For any other temperature the figures are incorrect, since the resistance of metals increases with rising temperature. For copper and aluminum the ohms increase about 0.2% for each degree, so that at 88° the resistance is 4% greater than indicated by the table.



This vacuum cleaner hose must carry a large current of air with little resistance. Hence it is made as large as practicable. What would be the loss of pressure in a similar tube twice as long?

Allowable Current.—Wires carrying current become heated, and the temperature rises until the loss of heat to the surroundings equals the heat developed. Then the temperature remains stationary. The hotter the wire becomes, the more heat it can give off per second, so that (unless it is surrounded by a non-conductor of heat like asbestos) the temperature of a wire depends upon the watt loss in it, which in turn depends upon the current.

The insulation upon conductors used in inside wiring will deteriorate if exposed to heat, and hence the temperature rise of the wires must be strictly limited. The National Board of Fire Underwriters issue in the "National Electric Code" a table of the current to be allowed in copper wires used for



This cable carries current 26,775 feet across the Golden Gate for the Pacific Gas & Electric Company. What is the resistance of each of the 250,000 circular mil conductors? What is the voltage at the other end of the telephone pair if 40 volts are applied at the San Francisco end and a current of .3 amperes is allowed to flow?

interior wiring. This is given in the wire table accompanying this lesson. Note that the current in rubber insulated wire must be kept smaller than in wires with other insulations, on account of the fact that rubber deteriorates at lower temperature than other insulations.

Aluminum, Iron, and Other Wires.—Since aluminum has a lower conductivity than copper, wires of aluminum must be larger than copper wires for the same current. But its density is so much lower than that of copper that the larger aluminum wire weighs much less than the copper it replaces. Knowing the size of copper needed for a certain load, one can select an aluminum wire two sizes larger (in the B. & S. gage) and figure the weight as 1/2 that of the copper.

Iron wire, used to some extent for telephone lines, has much higher resistance than copper or aluminum. It is manufactured in sizes different from those in the B. & S. gage, the system followed being called the "Birmingham wire gage." The grade known as "Best Best" (B.B.) has the following characteristics in two sizes much used:

No. (B.W.G.)	C.M.	Lbs. per mile	Ohms per mile
9	21904	314	17.84
14	6889	99	56.56

Suppose that No. 14 B.B. wire is to be used to make a resistance for an arc lantern. If the line voltage is 110, the pressure across the arc 70 volts,

and the current to be used is 18 amperes, how many pounds of wire should be bought? The drop in the wire = 110—70 = 40 volts; the resistance = volts/ amperes = 40/18 = 2.22 ohms. The table gives the ohms per mile for No. 14 as 56.56, hence the ohms per foot = 56.56/5280 = .0107; 2.22/.0107 = 207, the number of feet of wire. The lbs. per mile is given as 99; 99/5280 = .0187 lbs. per foot; hence our wire weighs 207 X .0187 lbs. or 3.88 pounds.

When resistance is desired, it is usual to take instead of iron a wire of some composition, such as "German Silver," "Climax," or "Nichrome." The German silver is an alloy of copper, zinc and nickel; most other special resistance materials are alloys of steel with nickel, etc.

These materials are made into flat and square conductors and round wires, the B. & S. gage being generally adopted for the round wires. To calculate the resistance of any wire, find the ohms of a piece of copper wire of the same size and length, and multiply by the proper multiplier: for Nichrome multiply by 60; for Climax multiply by 50; for German Silver (ordinary, with 18% nickel) multiply by 20; for Brass multiply by 4.4; for Aluminum Bronze multiply by 7.5; for Steel multiply by 8.3. To find the weight of Nichrome wire multiply the weight of a similar copper wire by .92; for Climax multiply by .92; for 18% German Silver multiply by .95; for Steel multiply by .88.

WIRE TABLE

Resistances given for temperature of 68° Fahr.
Abbreviations: W.P. = Weatherproof insulation; R. C. = Rubber Covered; Cir. = Circular;
Diam. = diameter; Amps. = Amperes; Lbs. = Pounds.

Gage No. B.&S.	Diam. Mils	Area. Cir. Mils	COPPER				ALUMINUM			
			Ohms per 1000 ft.	Lbs. per 1000 ft.	Safe Amps. W.P.	Safe Amps. R.C.	Ohms per 1000 ft.	Lbs. per 1000 ft.	Safe Amps. W.P.	Safe Amps. R.C.
0000	460.0	211600	.0489	640.5	326	226	.0804	192.0	273	189
1	289.3	83690	.1237	263.3	160	100	.2032	76.0	126	84
3	229.4	52630	.1967	159.3	100	80	.3230	47.8	84	67
4	204.3	41740	.2480	126.4	90	70	.4076	37.9	76	59
5	181.9	33100	.3128	100.2	80	65	.5140	30.0	67	46
10	101.9	10380	.9972	31.43	30	25	1.640	9.42	26	21
18	40.30	1624	6.374	4.92	5	3	10.49	1.47	4	2.5
36	5.00	25	414.2	.076			681.0	.023		

SPARKS—Current Facts, Figures and Fancy

(The days of the London fog are numbered, Tokyo is going to do away with fires, and electricity is preparing to make photographers superfluous. To balance this wholesale program of abolition are items concerning a tunnel under the English Channel and a new application of X-rays.—The Editor.)

An X-ray device for detecting flaws in concrete ships is the subject of a recent article on shipping. The procedure is to show by means of a series of X-ray photographs that the standard of uniformity of mix and compactness is maintained; to observe misplacement of reinforcing, and to detect the presence of voids. The X-ray outfit weighs about ninety pounds.

* * *

Strap-hangers take up less room than seated passengers, wherefore a Japanese municipality has conceived the ingenious idea of removing the greater number of the seats from its street cars in order to relieve the overcrowding. It is not recorded whether the decreased comfort of this method of traveling operates in the same direction by inducing more people to walk.

* * *

London without its fog would be an anomaly indeed, but in spite of the fact that the fog ranks with the British Museum as one of the things for which London is famous the world over, British scientists propose to abolish it. By a system of sucking pipes, connected with air-washers which remove the smoke particles, the fog is to be subjected to a filtering process and ejected as air fit for human respiration.

* * *

Tokyo has set out to live down its reputation for great fires, one of which occurred quite recently, by organizing a fire and burglar alarm company. The company, which came into being a year ago, is now prepared to begin operations with a network of alarm circuits connecting subscribers to police and fire stations, and operated entirely by electricity. Until this enterprise was started Tokyo had no system of fire or burglar alarm.

* * *

It is prophesied that there will shortly be a tremendous demand from Norway and Sweden for electric and hydraulic machinery. Coal in these countries is very scarce, while water-power for electricity is plentiful. During the war the blockade prevented the importation of the necessary machinery, but now that there is nothing to hinder the development of the natural resources, electricity will tend to replace steam and oil in every field.

* * *

Breaking up German submarines for scrap metal is becoming an important industry in Swansea, England. Messrs. G. Cohen Sons & Co. of London and Swansea have recently purchased at auction

twenty-five German submarines, and estimate that the breaking up value of each will be about \$12,166. They will employ considerable additional labor and the work on each vessel will occupy ten weeks. The metal will then be sold to the various tinplate and steel mills in the district.

* * *

A phenomenal deposit of pigment has occurred in the shallow waters of the Salton Sea. The colors range from pale yellow to brown and red, together with black and some shades of green. Some of these ochre deposits are in a form suitable, after slight cleaning, for immediate use as paint. The owner of the accumulation has his buildings, automobile, etc., painted with the natural pigment for purposes of demonstration, and is aiming at making it the subject of a successful commercial enterprise.

* * *

Electricity bids fair to put the photographer out of business. A wonder working, electrically controlled machine recently put on the market takes your photograph, develops, prints and delivers it—all in the space of one minute and for a cost of one dime. The time-honored admonition of the photographer—"look pleasant"—is the only element which the machine omits. A phonographic attachment, however, may eventually be added by some enterprising spirit.

* * *

A tunnel under the English Channel is now being seriously considered again. Excavations were actually started, both from the French and English sides a great many years ago, but were abandoned owing to the objections of the two governments. The chief advantage of such a tunnel as now contemplated would be the rapid and effective long-distance telephone service between England and the continent. At present the only connection of the kind is by submarine cable.

* * *

The high cost of living is nothing compared to the high cost of commas when they are misplaced in government documents. In the Tariff Bill which provides that "foreign fruit plants" be admitted free so as to encourage the raising of foreign fruit trees, this phrase was printed to read "foreign fruit, plants." This particular comma, before it could be corrected, cost the United States Government over two million dollars in customs revenues by allowing oranges, grapes, lemons, bananas, etc., to come in free of duty.

PERSONALS

R. H. Ballard, vice-president of the Southern California Edison Company, has been elected president of the National

Electric Light Association for the coming year. The next great national convention is to be held at Los Angeles. It is too early to tell as yet just how the activities of the Pacific Coast Section and the mother association will be made to work to the one common end of putting over the greatest and most successful year in the history of these associations, yet all members of the industry agree that the spirit to will

and to do is here, and as yet a definitely formulated plan is alone lacking to bring these great ideals of helpfulness into immediate action. But this we know, that the broad vision of Russ Ballard will soon get into action and then, watch things move. Here's to you, Russ Ballard, and here's knowing that every conceivable detail will be worked out in your master mind, and when you say the word—well, there's one thing—"the gang's all here."

Wm. E. Barker, general sales manager U. S. Rubber Company, Wire Division, is visiting the Pacific Coast.

C. C. Martin, Seattle representative of the Benjamin Electric Manufacturing Company, has been at Butte, Mont.

L. A. S. Wood, sales manager Geo. Cutter Company, has returned to South Bend, Ind., after attending the Pacific Coast electrical conventions.

Geo. Hull Porter of the Western Electric Company sales organization has been visiting the Pacific Coast offices of the company during the past two weeks.

H. B. Squires, representative at San Francisco of a number of electrical manufacturers, is attending the convention of electrical supply jobbers at Hot Springs, Va.

Mortimer Fleishhacker, president of the Great Western Power Company and first vice-president of the Anglo-London-Paris National Bank, has been visiting in Portland, Ore.

H. A. Lemmon of Reno, Nev., sales manager for the Truckee Light & Power Company, and former U. S. Food Commissioner for Nevada, was a recent visitor in San Francisco.

R. J. Dunwoody, formerly sales manager of the Capital Electric Company, Salt Lake City, has resigned to accept a position with the Blue Bird Appliance Company of St. Louis, Mo.

Joseph L. Jaffe, vice-president and general manager of the Perfec-lite Manufacturing Company, Seattle, has been called to San Francisco and Los Angeles. He will return to Seattle early in June.

Carl E. Johnson, manager of the U. S. Electrical Manufacturing Company with headquarters at Los Angeles, has returned from an interesting eastern trip, returning by way of San Francisco.

Lars R. Jorgensen of San Francisco, consulting electrical and hydraulic engineer, and John B. Fisk of Spokane, were elected vice-presidents of the American Institute of Electrical Engineers at the annual meeting held at Boston on May 16.

Herbert C. Moss of the Standard Electric Company, Seattle, has been employed by the Western Coke & Collieries Company to install an electric locomotive and hauling system,

an aero tram compressor and other modern coal mining equipment at its property near Snoqualmie, Washington.

W. E. Jones, district sales manager of the Economy Fuse Manufacturing Company, Seattle, is spending some time in Portland. He lately returned from a trip to Denver, Salt Lake City and other points.

R. T. Stafford, manager of the Seattle office of the Allis-Chalmers Manufacturing Company, won the Byllesby trophy at the Coronado conventions early in May, which represents the golf championship of the Pacific Coast Section of the National Electric Light Association.

D. E. Wiseman, equipment engineer of the Pacific Telephone & Telegraph Company, has been presented with a German helmet by the chairman of the Liberty Loan activities in New York, for his energetic services during the drive. Mr. Wiseman spoke every night in New York theatres and at several noon sessions.

W. I. Wallace, vice-president for Idaho of the Northwest Electric Light and Power Association, has left Boise, Idaho, and severed his connection with the Idaho Power Company as vice-president and general manager, to go with the Gulf Oil Company. He is succeeded by W. R. Putnam of the Utah Power & Light Company.

W. E. Coman, vice-president and general manager of the Washington Water Power Company, Spokane, has been named by the executive committee as vice-president for Washington of the Northwest Electric Light and Power Association, succeeding M. C. Osborne. Mr. Coman also succeeds Mr. Osborne as a member of the executive committee.

J. F. Farquhar has been made general agent of the Palouse and Big Bend districts for the Washington Water Power Company, and Lewis A. Lewis sales manager for the same company. Both Mr. Farquhar and Mr. Lewis, who have been associated with the Washington Water Power Company for several years, have been active in the Northwest Electric Light and Power Association, Mr. Farquhar having served as secretary.

C. E. Grunsky of San Francisco has been appointed to the executive committee which will consider the formation of a National Department of Public Works. On the campaign committee which will conduct the western activities are H. S. Crocker and D. W. Brunton of Denver; R. H. Thompson, Seattle; C. F. Swigart, Portland; W. L. Huber, Louis Mulgardt, Robert Sibley, and F. W. Bradley of San Francisco; P. H. Norhoe, Sacramento; J. C. Ralston, Spokane; R. C. Gemmel, Salt Lake City; Geo. A. Damon and J. B. Lippincott of Los Angeles, and J. C. Greenway, Bisbee, Ariz. These appointments were made on the recommendation of the recent Conference of Engineering Societies at Chicago.

E. O. Edgerton, president of the California Railroad Commission, has placed himself on record in the matter of

ideals for utility service in a manner that has won for himself the esteem and hearty endorsement of all well-wishers for the upbuilding of our great West. His emphatic remarks—timely and well chosen—as delivered at the recent Coronado convention, appear in full elsewhere in this issue of the Journal of Electricity. The electrical industry in the West has set high standards of accomplishment, perhaps

equaled nowhere else in the world. To its standards it has attracted the brightest brains of the nation, and the president of the Railroad Commission believes all is well so long as these high ideals are held in view and put into practical application.



J. R. Tomlinson, State Executive Committeeman from the First District and National Executive Committeeman from Oregon, Roy C. Kenney, and J. W. Oberender, chairman and secretary, respectively, of the Oregon Association, attended the second quarterly meeting of the State Executive Committee at Medford, Ore., and are here shown, reading from left to right, visiting the power plant of the California-Oregon Power Company. The picture was snapped by B. W. Paul, State Executive Committeeman from the Second District and owner of Paul's Electric Store at Medford.



W. G. Hagens, manager of the Western Union Telegraph Company, New York City, is a recent San Francisco visitor.

C. C. Hillis, manager of the Electric Appliance Company at San Francisco, is attending the electrical supply jobbers' convention at Hot Springs, Va.

V. D. Harrison, purchasing agent of the Pacific States Electric Company at the Seattle office, is spending two weeks at the head office in San Francisco.

F. H. Murphy, illuminating engineer of the Portland Railway, Light & Power Company, Portland, Oregon, has been confined to his home with influenza.

C. C. Barrick, president of the Union Metal Manufacturing Company, makers of Union metal standards for street lighting, has recently been in San Francisco.

Lient. Ellery Stone, U. S. N., who has been in charge of the radio stations of Southern California for the last two years, has been transferred from San Diego to San Francisco.

T. M. Putnam of the University of California Mathematics Department, and B. F. Raber of the Mechanics Department, have been promoted from Associate Professor to Professor.

F. D. Nims, vice-president and general manager of the Washington Coast Utilities, Seattle, is making a business trip to Boston and other eastern cities. He is expected back early in June.

F. A. Koester of the general construction department of the Pacific Gas & Electric Company, has recently returned from France where he has been serving as a lieutenant with the 74th Engineers.

A. C. Alvarez of the Civil Engineering Department of the University of California, and B. M. Woods of the Mechanics Department, have been promoted from Assistant Professor to Associate Professor.

P. M. Lincoln of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., is a recent San Francisco visitor. Mr. Lincoln is a past president of the American Institute of Electrical Engineers.

Edward T. Cook has joined the San Francisco district sales force of the Trumbull Electric Manufacturing Company. Mr. Cook's name was misconstrued as "Clark" in the issue of May 1st, where the announcement was originally made.

L. E. Levee, sales manager of the Clemens Electric Corporation and vice-president of the Electric Club of Buffalo, N. Y., has been spending a short time in San Francisco. He has closed selling arrangements on the J. C. refillable plug fuse with the H. D. Squires Company for the San Francisco and Los Angeles territory.

Lieut. E. M. Wright, formerly with the Pacific Gas & Electric Company, San Francisco district, has recently been discharged from the 56th Engineers. Lieut. Wright had the distinction of being in charge of the first searchlight party actively engaged on the front.

Willis M. Deming was elected president of the Technical Publishing Company, publishers of the Journal of Electricity, at a recent meeting of the directors. The other officers elected were Robert Sibley, vice-president; Arthur H. Halloran, secretary; R. J. Davis, treasurer.

E. M. Chandler of Yakima has been offered the position of chief engineer to the State Reclamation Board of Washington. Mr. Chandler is a graduate of the University of California and for the past two years has been president of the Washington Irrigation Institute.

C. P. Deming, manager of the Seattle office, National India Rubber Company, is making a trip to Salt Lake City where in conjunction with W. E. Barker, general sales manager of the company, he will make arrangements for opening an office and establishing a warehouse.

S. C. Jaggard of the Morrison Electric Company, who is also president of the Mason Tire Sales Company, has promised to care for emergency tire troubles (through Mason service stations) on an ocean to ocean automobile trip being undertaken by H. M. Carloch, western insurance man.

Geo. A. Schneider, well known to readers of the Journal of Electricity as the author of technical articles on electrical practice, has resigned from his position as manager of the Western Electric Company's Buffalo office. He will be succeeded by Walter Treat Walker, formerly manager of the Newark office.

W. L. Goodwin of the General Electric Company and Samuel Chase of the Westinghouse Electric & Manufacturing Company are to be speakers at a series of western get-together meetings. These are scheduled as follows: May 22-23, Portland; May 26-27, Vancouver; May 28-29, Seattle; May 30-31, Spokane; June 2-3, Salt Lake City.

Gregory Brown has been appointed to succeed Walter Treat Walker as manager of the Newark office of the Western Electric Company. Mr. Brown joined the Engineering Department of the company in 1905, transferred to the General Telephone Sales Organization in 1911, and in 1914 became acting assistant manager of the Cincinnati office. In 1916 he went to the New York office as supply specialist, remaining there until his appointment to the Newark managership.

Homer L. Ferguson, president and general manager of the Newport News Shipbuilding and Dry Dock Company of Newport News, Va., has been elected president of the Chamber of Commerce of the United States. Mr. Ferguson is a member of the Society of Naval Engineers, the Society of Naval Architects and Marine Engineers, and the Engineers' Club, New York. Frederick J. Koster of San Francisco was elected to the Executive Committee, and A. E. Carlton of Colorado Springs and J. E. Chilberg of Seattle to the Board of Directors.

W. L. Goodwin, who has recently been spending some weeks in the West, carrying forward his plans of cooperation in the industry, is in possession of a little leather booklet which he may be persuaded to display on occasion. It contains the resolution of appreciation passed in his honor by the Advisory Board of the Electrical Contractors' Associations of the City of New York on the occasion of their passing their records over to their successors, the present association, and reads in part as follows:

Whereas, The Electrical Contractor-Dealer industry of Greater New York recognizes the value of the constructive and guiding genius, the great ability and untiring energy of its friend and honorary member,

William Lincoln Goodwin of California, and further recognizes that through him has been laid a foundation for the reorganization of the industry, which for all time places it on a businesslike and substantial basis, therefore be it

Resolved, That this Board put on its records this unanimous expression of its esteem and appreciation as a partial, though inadequate recognition of Mr. Goodwin's services to the electrical industry in the East.

Meeting Notices for Electrical Men

(Interesting Contractor-Dealer meetings are announced, together with plans for a Santa Cruz convention to be held by the State Association. The engineering societies of San Francisco and the Northwest are active, and the Jovian Electric League and San Francisco Electrical Development League report successful gatherings during the past two weeks. The Society for Electrical Development reviewed an interesting year of work at its annual meeting.—The Editor.)

Jovian Electric League, Los Angeles

On May 14th the Jovian Electric League held a most successful luncheon, with Frank J. Airey, manager of the Pacific States Electric Company, as chairman of the day. Two hundred and twenty-five persons were present at the luncheon and the feature of the event was the address by Samuel M. Kennedy, general agent of the Southern California Edison Company, on "The Man in the Street." This paper, which was read at the Coronado convention of the N. E. L. A., has met with much favorable comment.

At the luncheon held on the 21st the speakers of the day were Al. Jennings and Harry Owens. Mr. Jennings' subject was "Why the Wheels go 'Round," while Mr. Owens spoke on the movies. Richard Wolfsberg, manager of the Electric Agencies Company, Inc., was chairman.

San Francisco Electrical Development League

At a most interesting Westinghouse meeting held on May 12, W. L. Goodwin, founder of the famous "Goodwin Plan," spoke with great effect on Cooperation as a National Activity. W. W. Briggs, formerly general agent of the Great Western Power Company, San Francisco, now New York district manager for the Westinghouse Company, received an ovation on this occasion of his visit to the West, and spoke most convincingly on why it is necessary for every one to assist in forwarding the cooperative idea. The meeting was one of the most enthusiastic and largely attended of the year.

At the meeting of the League held on May 19th, Capt. E. A. Graupner delivered an extremely interesting address embodying his experiences of the attitude of the French people in its relation to the treaty of peace.

California Electrical Contractors and Dealers Association

The California State Association of Electrical Contractors and Dealers will hold a two days' convention at Santa Cruz, June 27 and 28, 1919. There will be a Contractor-Dealer session on Friday, the 27th, and on Saturday the presentation and discussion of papers on retail practices and merchandising. A banquet will be held on Saturday evening, with H. F. Jackson of the Sierra & San Francisco Power Company as toastmaster.

San Francisco Meeting of Electrical Contractors and Dealers

At the San Francisco meeting, held on May 17, W. L. Goodwin and Samuel Adams Chase were the principal speakers. The ills of the industry were discussed before a large and interested audience, and the problems stated with great

frankness. Great good is expected to result from the straightforwardness which was the feature of this meeting, as it was at the meeting of the San Francisco Association on May 19, where the problems of the industry were the subject of three hours' discussion.

Oregon Association Electrical Contractors and Dealers

The regular meeting for District No. 1 was held on May 5th. The Salem Electric Company was unanimously elected to membership; the communication from the National Association in regard to the establishment of Education and Research was read and discussed, and plans were considered for the meeting to be held upon the visit of W. L. Goodwin and Samuel A. Chase.

A. S. M. E. Spring Meeting

The Spring meeting of the American Society of Mechanical Engineers will be held at Detroit June 16-19, inclusive. The first day will be devoted chiefly to discussion of the aims and organization of the society. On June 17 the program includes papers and reports on Industrial Research and addresses on Industrial Relations. The remaining two days will be occupied by technical papers contributed by local sections, and miscellaneous technical sessions.

A. S. M. E., San Francisco Section

Under the chairmanship of Professor W. F. Durand of Stanford University, the Research Committee is circularizing the local membership for the purpose of finding out and tabulating particulars concerning the research work of the members. A similar circularization is being conducted under the chairmanship

of Robert Sibley, editor of the Journal of Electricity, with regard to the war activities, and is expected to bring forth results very favorable to the San Francisco Section.

American Association of Engineers, Portland Chapter

At a recent meeting of the Portland chapter of the American Association of Engineers the following officers were elected for the year: W. H. Marsh, president; A. H. McKeen, T. W. Saul and O. Laurgaard, vice-presidents; R. W. Barnes, secretary, and C. F. Thomas, treasurer. Various committees were also appointed.

Oregon Society of Engineers

A Public Speaking Class has been organized by the Oregon Society of Engineers. The class is to meet in the Public Library Building every Tuesday evening for three months, the fee for the full twelve lessons being \$7.

Northwest Electric Light and Power Association

The annual convention of the Northwest Electric Light and Power Association will be held in Seattle, Wash., Sept.

BUILDERS OF THE WEST—LIV.



DAVID C. HENNY

The development of our vast storage basins throughout the West so that the thirsty land may be made to blossom in grateful response to the hand of the engineer, has been a labor of love in which a host of our noted engineers have been engaged during the past score of years. To David C. Henny, consulting hydraulic engineer of Portland, Oregon, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial for his helpful work in harnessing the forces of nature and conserving our water resources in the West, where engineering attainment of this nature has been equaled nowhere else in the world.

10, 11, 12, 1919. A tentative program of great value has already been arranged.

The following committees of the association are announced:—

Executive Committee.—O. B. Caldwell, chairman, Portland, Ore.; P. A. Bertrand, Aberdeen, Wash.; George D. Brown, Wenatchee, Wash.; L. B. Faulkner, Olympia, Wash.; H. J. Gille, Seattle, Wash.; Lewis A. McArthur, Portland, Ore.; W. E. Cohman, Portland, Ore.; Guy W. Talbot, Portland, Ore.

Hydroelectric Technical Committee.—G. E. Quinan, chairman, Seattle, Wash.; J. B. Fiske, Spokane, Wash.; L. T. Merwin, Portland, Ore.; F. D. Nims, Seattle, Wash.; R. M. Boykin, Portland, Ore.; H. H. Schoolfield, Portland, Ore.; H. L. Walther, Medford, Ore.; W. H. Trenner, Boise, Idaho.

Public Policy Committee for Washington.—L. B. Faulkner, chairman, Olympia, Wash.; Elmer Dover, Tacoma, Wash.; F. D. Nims, Seattle, Wash.; P. A. Bertrand, Aberdeen, Wash.; R. M. Boykin, Portland, Ore.; Eugene Enloe, 521 First avenue, Spokane, Wash.; George D. Brown, Wenatchee, Wash.; W. J. Grambs, Seattle, Wash.; J. M. Kincaid, Port Townsend, Wash.; F. H. Gay, Vancouver, Wash.; Douglas Allmand, Anacortes, Wash.; L. A. McArthur, Portland, Ore.; D. L. Huntington, Spokane, Wash.

Public Policy Committee for Oregon.—George L. Myers, chairman, Portland, Ore.; R. H. Steelquist, Albany, Ore.; George G. Bowen, Portland, Ore.; L. P. Lumpee, Vale, Ore.; R. M. Boykin, Portland, Ore.; C. J. Edwards, Tillamook, Ore.; T. H. Foley, Bend, Ore.; H. V. Gates, Portland, Ore.; J. P. Lottridge, Portland, Ore.; Robert L. Rockwell, Ontario, Ore.; E. G. Robinson, Canby, Ore.; C. M. Shinn, Cottage Grove, Ore.; J. T. Thompson, Sheridan, Ore.; R. M. Townsend, Portland, Ore.; H. L. Walther, Medford, Ore.; C. E. Taylor, Stayton, Ore.; H. H. McCormack, St. Helens, Ore.

Program Committee.—R. W. Clark, chairman, Seattle, Wash.; A. C. McMicken, Portland, Ore.; L. A. Lewis, Spokane, Wash.

Joint Meeting

At a joint meeting of the Northern California Association of Sales Managers and Purchasing Agents, held at the Commercial Club rooms on Thursday, May 15, the program was devoted to a most interesting discussion as to whether prices will rise or fall during the succeeding months. About 150 were present.

Society for Electrical Development

The annual meeting of the Society for Electrical Development took place in New York City on May 13. Members of the Board of Directors were elected as follows: W. D. Steel, E. C. Graham, James R. Strong, Fred B. Adam, Charles W. Price. The annual report, read by J. M. Wakeman, general manager, outlined the activities of the society during 1918 and showed that in spite of the handicap of the war a tremendous amount had been accomplished. In addition to the work carried on through the daily newspapers, popular magazines and the trade press, the society has distributed a number of interesting and instructive booklets direct to the electrical industry, and organized a series of national campaigns. The society has under consideration an important and far-reaching plan connected with the reconstruction of the industry, and necessitating cooperation on a large scale.

A. I. E. E. Booklet

The A. I. E. E. has issued a neat booklet summarizing the scope of the Institute, its activities, meetings, publications, membership, and so forth. Besides being of value as a year book to its members, the summary serves to acquaint non-members with the aims and achievements of the organization and the condition and privileges of membership.

A. I. E. E., San Francisco

The meeting of the San Francisco Section of the A. I. E. E. held at Palo Alto on May 23 was the most largely attended of any this year. After lunch at one of the Palo Alto restaurants the members were taken through the factory of the Federal Telegraph Company, where they enjoyed a most interesting lantern slide lecture, by Dr. Leonard Fuller, on recent developments in radio telegraphy. Experiments in high voltage and high frequency were performed, showing that the ordinary type of insulator is entirely inadequate to withstand 10,000 volts, 60,000 cycles. There was exhibited a new type of insulator, the product of the Federal Telegraph Company, which is capable of withstanding these tests.

Meeting of Advisory Committee, California Electrical Cooperative Campaign

The Advisory Committee of the California Electrical Cooperative Campaign at their meeting at the Commercial

Club, May 15th, among other things discussed the development and enlargement of the work along lines suggested by papers and discussions at the Coronado convention.

Probably the most important of these proposed activities provides that the field representatives shall enroll the assistance of the contractor-dealers in an effort to accurately gauge public opinion regarding the present service given by the electrical industry and the public's need for improved service, paying particular attention to the public's attitude toward our central station companies.

Captain H. F. Jackson, general manager of the Sierra & San Francisco Power Company, presented the need for this work so convincingly that the committee now considers it one of their most important activities.

Proper cooperation with the architects is another of the new activities which is under discussion. The committee hopes to work out something on this subject along the lines of the paper, discussion and resolutions presented at the Coronado convention.

Messrs. W. L. Goodwin and Samuel Chase, the Cooperation Promoters of the General Electric Company and the Westinghouse Electric & Manufacturing Company, respectively, were present at this meeting of the Advisory Committee and added ideas of value, as well as constructive criticism and suggestions for the assistance of the committee.

The names of salesmen representing manufacturers and jobbers who are available for service on the Cooperative Campaign Salesmen's Auxiliary were presented and briefly discussed at this meeting. A special committee was appointed to select the men who would best assist in this work, and the full organization and personnel of the Salesmen's Auxiliary will be announced by the middle of June.

Information regarding the Standard Accounting System of the National Association of Electrical Contractors and Dealers has been received and the field representatives are now receiving instructions from expert accountants regarding its use. By June 1 they will be in a position to tell contractor-dealers throughout California about this very desirable accounting system.

The next meeting of the Advisory Committee will be held at the Athletic Club in Los Angeles on Friday and Saturday, June 6th and 7th. Because of the new activities which are coming up for discussion and the apparent necessity of enlarging the Campaign work, it is bound to be a full and interesting meeting.

Utah Section, A. I. E. E.

The Utah section of the American Institute of Electrical Engineers held a meeting May 14. Engineers of the Utah Power & Light Company furnished the following program:

"Generation and Transmission"—P. P. Ashworth, construction engineer, Phoenix Utility Company; H. L. Melvin, assistant engineer, Utah Power & Light Company.

"Dispatching and Operation"—H. S. Buchanan, chief dispatcher, Utah Power & Light Company.

Electric Railroad Club

At the annual meeting of the California Electric Railway Association held in San Francisco on May 19 the following officers were elected: President, W. R. Alberger; vice-president, W. E. Dunn; manager, W. V. Hill. Jesse W. Lilienthal, W. Clayton, Paul Shoop, W. R. Alberger and W. E. Dunn were re-elected members of the executive board.

American Association for the Advancement of Science

The Pacific Division of the American Association for the Advancement of Science will meet at Pasadena from June 19 to 22. The subjects to be considered are all on the topic, "Scientific Education in a Democracy." Papers will be given by Dr. James A. B. Scherer, Dr. George E. Hale, Honorable Chester H. Rowell, Dr. W. F. Durand, Dr. E. W. Bailey, Dr. J. A. L. Waddell, and Dr. E. C. Moore.

WESTERN MEETINGS

Engineers' Club of San Francisco—

May 13, 1919—Dr. W. W. Campbell, Director of Lick Observatory—"Comets and Meteors."

A. I. E. E., Spokane—

May 16, 1919—Annual meeting—Foster Russell—"Development of the Airplane."

A. I. E. E., Denver—

May 17, 1919—Annual meeting. Dr. Albert C. Crehore—"Progress in Atomic Theory."

A. I. E. E., Seattle—

May 20, 1919—L. T. Merwin—"Novel Features of a High Pressure Steam Distribution System Recently Installed at Portland."

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers

President—Comfort A. Adams, Harvard University.

Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.

Meetings—Monthly.

Los Angeles Section

Chairman—J. H. Cunningham, General Electric Co., Los Angeles.

Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.

Meetings—Second Tuesday of each month.

Portland Section

Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittcock Block, Portland, Ore.

Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.

Meetings—Monthly.

Denver Section

Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.

Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.

Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section

Chairman—J. C. Clark, Stanford University, Cal.

Secretary—Allen G. Jones, Rialto Bldg., San Francisco.

Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section

Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.

Secretary—T. C. Smith, City Lighting Department, Seattle, Wash.

Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section

Chairman—George Nixon, Main and Lincoln Sts., Spokane.

Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.

Meetings—Third Friday of each month.

Utah Section

Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.

Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section

Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.

Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch

Chairman—A. E. McMahon, University of California, Berkeley, Cal.

Secretary—D. D. Davis, University of California, Berkeley, Cal.

University of Colorado Branch

Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch

Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch

Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.

Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Montana State College Branch

Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.

Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Throop College of Technology Branch

Chairman—Mark Sawyer, Throop Dormitory, Pasadena, Cal.

Secretary—Russell Otis, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch

Chairman—Clarence E. Guse, Pullman.

Secretary—Ralph C. Guse, State College of Washington, Pullman.

Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers

Chairman—W. Creighton Peet.

Secretary—W. H. Morton, 110 West 40th St., New York.

Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland, J. F. NePage, Seattle, Wash.

British Columbia Ass'n Electrical Contractors and Dealers

President—E. Brettell, Vancouver, B. C.

Secretary—Capt. W. J. Conway, Vancouver, B. C.

Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers

President—M. A. DeLew, 180 Jessie St., San Francisco.

Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco

President—C. L. Chamblin, 641 Mission St., San Francisco.

Secretary—J. Stewart, San Francisco.

Meetings—Saturday 12:30; The States.

Southern California Electrical Contractors and Dealers

President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.

Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.

Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers

President—W. Cox, Santa Cruz.

Secretary—D. K. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers

President—F. V. McAvoy, 138 N. Canter St., Reno.

Secretary—R. W. Shearer, 215 Sierra St., Reno.

Meetings—Twice a month, 15th and 30th.

Oregon State Ass'n of Electrical Contractors and Dealers

President—R. C. Kenney, 388 Burnside street, Portland.

Secretary—J. Willis Oberender, 209-10 McKay Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers

President—Roy C. Kenney, Portland.

Secretary—J. W. Oberender, 209-10 McKay Bldg., Portland.

Meetings—Alternate Mondays at Imperial Hotel Grill.

Sacramento Section, California Electrical Contractors & Dealers' Association

President—W. H. Gribble, Sacramento.

Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers

President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.

Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.

Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers

President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.

Secretary—Forrest E. Smith, Seattle, Wash.

Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBER'S ASSOCIATIONS

Electrical Supply Jobbers Association

General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.

Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers

President—W. S. Berry, Western Electric Company, San Francisco.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast

President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.

Secretary—Albert H. Elliot, 544 Market St., San Francisco.

Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign

Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.

Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

National Electric Light Association

President—A. E. Wishon, San Joaquin Light & Power Corporation.

Secretary—A. H. Halloran, Journal of Electricity.

Nevada Section, N. E. L. A.

Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.

President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.

Secretary—A. H. Halloran, Journal of Electricity, Electric Bldg., San Francisco.

Meetings—Annually, in April.

Portland Section, N. E. L. A.

Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.

Secretary—F. H. Murphy, Portland Railway, Light & Power Company.

Illuminating Engineering Society

President—George A. Hoadley.

Secretary—Clarence L. Law.

Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.

Meetings—First Tuesday each month.

New Mexico Electrical Association

President—D. W. Morgan, Las Cruces, N. M.

Secretary—Charles Twogood, Albuquerque, N. M.

Meetings—Annually, in February.

Southwestern Electrical and Gas Association
President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—H. J. Gille, Puget Sound Traction Light & Power Co.
Secretary—W. E. Herring, Puget Sound Traction, Light & Power Co.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

Los Angeles Jovian Electrical League
President—A. E. Peat, San Joaquin Light & Power Corp.
Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—Garnett Young, 612 Howard St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
President—Mortimer E. Cooley, Electrical Engineering Dept., Ann Arbor, Mich.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—John W. Cunningham, 414 Spalding Bldg., Portland.
Secretary—Orrin E. Stanley, Box 973, Portland.
Meetings—Annual: First Monday in February.
Monthly: Third Thursday of each month.
Third Thursday of each month.

The Engineers' Club of Seattle
President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—A. E. Chandler, New Call Bldg., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeoe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

Joint Committee Technical Societies of Los Angeles
Chairman—George A. Damon.
Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

Utah Society of Engineers
President—Leonard Cahoon.
Secretary—Wm. H. Kelsey.
Meetings—3rd Wednesdays except May, June, July and August.
Annual banquet—May.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

Portland Section A. S. C. E.
President—P. H. Dater, Eng. U. S. Forestry Service.
Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
Meetings—At call of president.

Spokane Engineering & Technical Ass'n
President—L. K. Armstrong, A. S. M. E.
Secretary—A. D. Butler, City Engineer, Spokane, Wash.
Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Los Angeles Transportation Association
President—C. G. Krueger, 324 S. Broadway, Los Angeles.
Secretary—D. W. Ferguson, 324 S. Broadway, Los Angeles.

HAPPENINGS IN THE INDUSTRY

PACIFIC STATES SALES MEETING

A meeting of Pacific States Electric Company salesmen and guests on the evening of May 12th was addressed by J. M. Smith, sales manager of the Ivanhoe Works of the General Electric Company. Mr. Smith clearly and forcibly explained how glare is eliminated by the "service to lamps" given by Ivanhoe Regent reflectors and accessories. H. B. Kirkland of the American Conduit Manufacturing Company also demonstrated the advantages of "Wiremold" for wiring. A number of electrical contractor-dealers of the San Francisco Bay district were among the guests present.

HOSPITAL SIGNAL SYSTEM

Battee & Bittman, Inc., of San Francisco, have furnished the Marine Hospital at San Francisco with a Holtzer Cabot hospital locking button signal system. The simplicity, flexibility, safety, compactness and economy of this low voltage, non-relay system is illustrated and described in a new brochure just published.

NEW LABORATORIES OF THE BUREAU OF MINES

During the week of Sept. 29th next, the Bureau of Mines, Department of the Interior, will formally dedicate, to the best interests of humanity, its new million-dollar laboratories and workshops in Pittsburgh, Pa.

A feature of the dedication will be a great, national Safety First meet. Teams of miners from all over the country will participate in contests in rescue work and in first aid to the injured. The dedication will be the occasion for a notable gathering of the engineers and scientific men of the

country. Visitors will be invited to the electrical and mechanical workshops and laboratories of the bureau and also to the petroleum, gas and coal laboratories, the testing gallery of the mine safety section, and the industrial gas-mask division.

NEW EXTENSION IDEA

The University of California, through its Extension Division, will offer free to the public a course of scientific lectures in the Yosemite Valley during June and July, 1919. These are to be known as the Le Conte Memorial lectures in honor of Joseph Le Conte, the famous naturalist and geologist.

The lecturers are Professors W. L. Jepson and A. L. Kroeber of the University of California, Professor Frederick William Bade, Literary Executor of John Muir, and Dr. F. Emile Matthes of the U. S. Geological Survey, Washington, D. C.

RADIO TELEPHONE SPEECHES

During the Victory Liberty Loan Drive the people of New York were addressed by means of radio telephones. Wireless antennae were stretched over Victory Way and 112 loud speaking telephone receivers were suspended from these in four rows. In front of the speaker's desk were three microphone transmitters on iron uprights, the wires and switches of the sending and receiving apparatus being inside the Railroad Y. M. C. A. Building. The wireless messages passed over the wires to the control room behind the speaker's desk, and were there amplified many million times so that they might be heard, through the medium of the loud-speaking receivers, by the crowds which thronged Victory Way.

IMPORTANT HYDROELECTRIC CONSTRUCTION PLAN

The State Railroad Commission has granted to the Great Western Power Company of California permission to issue \$6,000,000 bonds and \$1,500,000 preferred stock to finance the construction of a plant and transmission line on the North Fork of the Feather River. The plant will have a capacity of 40,000 kilowatts, and water will be obtained directly from Lake Almanor through a large intake tower. A 160,000 volt steel tower transmission line will convey the power to the Valona substation, a distribution center in the San Francisco Bay district. The plant will probably be completed in two years' time.

ELECTRICALLY EQUIPPED CAFE

The Blackstone Department Store at Los Angeles has equipped its cafe for electrical cooking with Simplex electric ranges and is considering devoting an entire floor to a cafeteria served entirely from Simplex ranges. Hamburger's at Los Angeles has also placed an order for Simplex equipment.

WESTINGHOUSE COMPANY ESTABLISHES MEMORIAL SCHOLARSHIPS

As a war memorial to the more than 8000 of its employes who have entered the service of the Government in the great war, the Westinghouse Electric & Manufacturing Company has decided to establish a number of technical scholarships. Candidates will be limited to sons of employes of the Westinghouse Electric & Manufacturing Company and its subsidiaries, who shall have been employes in good standing for a period of five years. The selection is to be determined by competitive examination to be conducted by the company's Educational Department, and the scholarships will entitle the successful candidate to pursue a four years' course in any technical school or college that he may select with the approval of the committee.

BIG WATER POWER STATION FOR FORMOSA

Plans are under way for harnessing the Nichigettan River in the Japanese island of Formosa, for power purposes. A company will be formed and, in conjunction with the local governmental authorities, will probably begin operations this year.

WESTERN MEMBERS ELECTED TO THE A. I. E. E.

The following were among those elected to Associate Membership in the A. I. E. E., April 11, 1919:

Albert W. Barresen, Instructor, The Mountain States Tel. & Tel. Co., Denver, Colo.; Ricardo Lane Bertolacci, Ensign, U. S. N. R. F., San Pedro, Asst. Inspector of Machinery, Union Plant, Bethlehem Shipbuilding Corp., San Francisco, Cal.; Raymond J. Carfield, Electrical Draftsman, Utah Copper Co., Garfield, Utah; Amos Albert Carroll, Electrical Inspector, Colorado Fuel & Iron Co., Pueblo, Colo.; Floyd H. Cberry, Assistant Professor of Electrical Engineering, University of California, Berkeley, Cal.; Hiram W. Clark, Technical Assistant, United States Bureau of Mines, Salt Lake City, Utah; William J. Crabbe, Division Supt. Sierra & San Francisco Power Co., Stanislaus, Cal.; Percy Henry Giannini, Operator, United Railroads of San Francisco, Cal.; George L. Hoffman, General Foreman, Mini-

doka Power System, U. S. R. S., Minidoka, Idaho; Philip D. Jennings, Asst. Engineer, Puget Sound Traction, Light & Power Co., Seattle, Wash.; Albert Johnson, Asst. Supt. of Elec. Distribution, Denver Gas & Electric Light Co., Denver, Colo.; James Bernard Kelly, Instructor in Elec. Engineering, State Agricultural College of Colorado, Fort Collins, Colo.; Thomas J. Lovell, Electrical Draftsman, U. S. Reclamation Service, Denver, Colo.; Alex W. Morgan, Results Engineer, Denver Gas & Electric Light Co., Denver, Colo.; Henry Hammond Plumb, Electrical Engineer, U. S. Reclamation Service, Denver, Colo.; Frederick Milton Servos, Electrical Engineer, Works Manager, Tudhope Electro Metals, Ltd., Vancouver, B. C.; Herman J. Snively, Salesman and Office Correspondent, Western Electric Co., Salt Lake City, Utah; Charles Byron Sordelet, Electrician, Colorado Fuel & Iron Co., Pueblo, Colo.; James Donald Sparks, Sales Dept., Western Electric Co., Salt Lake City, Utah; Stanley S. Stevens, Representative, Byron Jackson Iron Works, Century Electric Co., Bryan Marsh Mazda Lamps, Salt Lake City, Utah; Frank A. Stroessner, Estimating Engineer, Denver Gas & Electric Co., Denver, Colo.; John A. Tobyn, Chief System Operator, Washington Water Power Co., Spokane, Wash.; Harry L. Wickstrom, Asst. Supt. of Elec. Distribution, Denver Gas & Light Co., Denver, Colo.; Thomas Lee Walker, System Operator, Washington Water Power Co., Spokane, Wash.; Arnold F. Willat, Electrical Draftsman, Great Western Power Co., San Francisco, Cal.; Lewis Earl Wright, Electrical Inspector, U. S. Navy, San Francisco, Cal.; Fred S. Zaugg, U. S. N. R. F., Tacoma, Wash.

A LETTER TO THE EDITOR

To the Editor, Journal of Electricity:

It will be of interest to the readers of the Journal to learn that the Thirty-seventh Engineers (Electrical and Mechanical Regiment)—the only unit of its kind—is made up of electrical and mechanical experts recruited from every state in the Union. Even Panama, Alaska and the Hawaiian Islands are represented. The largest representation, however, hails from California.

The varied and often unique work of this regiment figured largely in all of the American offensives, particularly at St. Mihiel and in the Argonne. Isolated detachments were also active on many of the French fronts, from Chateau-Thierry to the Swiss border, doing all sorts of curious and hazardous work—charging barb-wire entanglements, running pumping plants in trenches and dugouts, and furnishing light and power for ever-changing posts and advancing units.

When the armistice was signed the "37th" was chosen for the Provisional Engineer Regiment which accompanied the First Army of Occupation. We were the very first troops to reach the Rhine; this was December 6th, at two o'clock in the afternoon. During our affiliation with the Army of Occupation the very nature of our work made it imperative that we travel ahead of all troops—to furnish light for the executive offices of the several units associated with the Chief Engineer office. At this time our working equipment consisted of portable gas-engine driven plants mounted on trucks and trailers; also trucks loaded with miscellaneous electrical and mechanical apparatus, machine shops, carpenter shops, etc.

Then, as a fitting finish to our great adventure, many of us were fortunate in visiting Paris, and a considerable number of the "37th" were called upon to contribute certain specialized work on the American Commission to Negotiate Peace.

Yours truly,

E. R. MURRAY,
Battalion Supply Sergt.,
1st Bn. Headquarters, 37th Engs.



The 37th Engineers on their recent arrival from France

MEMORIAL TO HENRY MORSE STEPHENS

The University of California committee in charge of the memorial for Professor Henry Morse Stephens has sent out a letter to the alumni with a view to having the memorial fund complete by Commencement Day.

CHANGES IN THE UNIVERSITY OF CALIFORNIA FACULTY

New appointments to the University of California faculty are: Abraham Press, Assistant Professor of Electrical Engineering, and F. H. Cherry, Assistant Professor of Electrical Engineering.

L. N. Robinson and A. B. Domonoske have been promoted from the rank of Instructor to Assistant Professor of Electrical Engineering and Mechanical Engineering, respectively.

The following members of the faculty of the University of California have returned from war leave: R. T. Crawford, Professor of Practical Astronomy; C. G. Hyde, Professor of Sanitary Engineering; A. J. Eddy, Assistant Professor of Civil Engineering; W. F. Langlier, Assistant Professor of Sanitary Engineering; A. C. Lawson, Professor of Mineralogy and Geology; H. B. Langille, Associate Professor of Machine Design and Mechanical Drawing; B. R. Van Leer, Instructor in Mechanical Engineering.

TRADE NOTES

New Installations —

Beckman & Linden Engineering Corporation are installing a 100 kw. furnace in their laboratory at San Francisco for experimental purposes and for the use of their clients. This furnace is of their own design and is the second experimental furnace of this size to be installed in the United States, the other being at Niagara Falls.

Mr. C. L. Hollis, president and manager of the Arctic Ice Company of Richmond, Cal., and is disposing of the Diesel engine which operates his plant, and will replace it with a 150 h.p. motor.

The Stockton division of the Western States Gas & Electric Company has received application from the Sperry Flour Company for 450 horsepower in motors to operate their new Crown Mills. The company will also supply the Pacific Gas & Electric Company with an additional 150 horsepower in motors to operate their new pumping plant at Stockton.

New Business —

Holbrook, Merrill & Stetson of San Francisco have been appointed agents for the Simplex Electric Heating Company of Cambridge, Mass., in California, Arizona and Nevada.

The American Manganese Company has recently contracted to take 2,000 electrical horsepower at their new plant on the Parr-McCormick properties on the Western Waterfront. This new industry will operate a large electrically installed furnace, the first of its kind used in the bay cities.

The Universal Paper Can Company is preparing to establish one of their plants in West Oakland. The item of wax milling will be taken care of by electrically operated heat apparatus.

The Union Oil Company at Olema are now purchasing electric power, generated by one of the Great Western Power Company's hydroelectric plants, in preference to making their own power through crude oil.

Radio Company —

The National Radio Company is just concluding a deal by which the rights for Mexico will be sold. Ground has been leased in San Francisco where all the improvements and accessories applicable to wireless telephony will be manufactured.

Commercial Campaigns —

The Commercial Department of the Arkansas Valley Railway, Light & Power Company of Pueblo, Colo., is conducting a series of campaigns on electrical household devices. A recent electric washing machine campaign resulted in the sale of 18 machines and prospects for many more. An electric vacuum cleaner campaign is now in progress and later another campaign will be opened on the small labor saving electric appliances.

New Offices —

William J. Morton of Morton, Bird & Whitman, Engineers, in addition to his offices in Chicago, Baltimore and Boston, has opened offices in the Astor Trust Building, 501 Fifth avenue, New York City, where he will continue his consulting work on utility rate regulation problems. In association with the Withington-Roberts-Wright Company of Cleveland, Ohio, Industrial Architects and Engineers, Mr. Morton will also engage in general industrial engineering.

Paul W. Koch & Company announce the opening of Pacific Coast offices in Los Angeles at 114 San Fernando Building, in San Francisco at 324 Rialto Building, and in Portland at 342 Sherlock Building. These offices will be devoted to pushing the business of the "Jiffy" labor saving tools.

The Albany, Oregon, division of the Mountain States Power Company has recently moved into new and more convenient offices at Albany.

The Western Electric Company, represented by C. B. Hawkins of Seattle, has opened a Walla Walla, Washington, office with the Walla Walla Implement Company. Particular attention is to be given to farm power and lights plants.

PRINCIPLES OF INDUSTRIAL RELATIONS

A committee of the Chamber of Commerce has drawn up the following thirteen principles, with a view to furnishing a basis on which American industry can build a national labor program:

1. Industrial enterprise, as a source of livelihood for both employer and employe, should be so conducted that due consideration is given to the situation of all persons dependent upon it.
2. The public interest requires adjustment of industrial relations by peaceful methods.
3. Regularity and continuity of employment should be sought to the fullest extent possible and constitute a responsibility resting alike upon employers, wage earners, and the public.
4. The right of workers to organize is as clearly recognized as that of any other element or part of the community.
5. Industrial harmony and prosperity will be most effectually promoted by adequate representation of the parties in interest. Existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and are adaptable to the peculiar conditions in the various industries.
6. Whatever agreements are made with respect to industrial relations, they should be faithfully observed.
7. Such agreements should contain provision for prompt and final interpretation in the event of controversy regarding meaning of application.
8. Wages should be adjusted with due regard to the purchasing power of the wage and to the right of every man to an opportunity to earn a living at fair wages, to reasonable hours of work and working conditions.
9. Fixing of a basic day as a device for increasing compensation is a subterfuge that should be condemned.
10. Efficient production in conjunction with adequate wages is essential to successful industry. Arbitrary restriction on output below reasonable standards is harmful to the interests of wage earners, employers, and the public and should not be permitted. Industry, efficiency and initiative, wherever found, should be encouraged and adequately rewarded, while indolence and indifference should be condemned.
11. Consideration of reduction in wages should not be reached until possibility of reduction of costs in all other directions has been exhausted.
12. Administration of employment and management of labor should be recognized as a distinct and important function of management and accorded its proper responsibility in administrative organization.
13. A system of national employment offices, with due provision for cooperation with existing state and municipal systems, can be made, under efficient management, and if conducted with due regard to the equal interests of employers and employes in its proper administration, a most helpful agency, but only if all appointments are made strictly subject to the Civil Service law and rules. Policies governing the conduct of a national system of employment offices should be determined in conjunction with advisory boards,—national, state and local,—equally representative of employers and employes.

A STEADY HAND, A HIGH HEART, AND A CLEAR MIND

A Letter to the Editor

(The long period of reconstruction and readjustment following the war will call for the best in all the citizens of all countries. Ronald T. Strong, formerly efficiency engineer with the Portland Railway Light & Power Company and more recently Lieutenant on the U. S. S. Marblehead, dwells on the especial responsibilities of the engineer and the manager, and the elements which they can and must contribute to the progress of the world.—The Editor.)

"We have come successfully through the first four years of war, what of the next twenty-five?" So speaks a well-known man of affairs. It may be true, but whether it be true or not, no one can doubt that a period of change and adjustment is to follow for many years. There is no need to dwell upon the dangers ahead but it is well to look them squarely in the face.

In this situation the same qualities will carry us through as have carried us successfully through the last four years. They are those named in the title, qualities which make for success in war and in peace alike. These qualities must be exhibited not only by the leaders and spokesmen of the country, but by business men, engineers, merchants, and men of all other professions. The engineer and the manager, men with minds trained in the solution of difficult problems, will be looked to particularly for the solution of the problems of adjustment which will arise.

A Steady Hand

The world is no longer in the stable equilibrium of past years. All the world influences, good and bad, have been quickened by this time of stress. New influences and movements have sprung up, and old ones have taken on new life. The world is full of creeds and isms, pulling ahead and hauling back, working at cross purposes, each intent upon its own method of obtaining the world's salvation. Each of these creeds has its hair-trigger thinkers and its irresponsible talkers. Against these the responsible thinking men must set themselves, preserving the balanced and orderly progress with a steady hand.

A steady hand is needed if the world influences are to make for world progress and not for world disruption, if we are to have reorganization and not revolution. There are tremendous possibilities for good in the present situation. Properly guided, the forces now available can accomplish almost overnight what was formerly the work of decades. The whole world is quickened, imbued with new life and new activity. Proper guidance is a prime requisite, there must be a strong hand to check the revolutionist and to prod the reactionist, a steady hand to guide the wayward.

The engineer has long been accustomed to dealing with the forces of nature. Of late years he has taken place among those who would guide the forces of industry. Let him now apply his training in this larger field,—the world lies before him.

A High Heart

Too many men face the problems of the day with fear and foreboding. It is true that revolution is rampant in Russia and the conquered portions of Europe. But looking back, one will see that in each of the great revolutions—the French Revolution of more than a century ago and the present day revolutions—the motive force underneath was want of food. There is no serious want of food in this or the allied countries, and with this one irresistible force eliminated it would seem that there are enough strong and well directed forces to keep the reorganization from becoming revolution. Surely it is better to give precedence to the great possibilities than to the dangers of the future.

The country has carried through this war with a high heart; all that is now required is to continue the same spirit. The engineers and managers of the country have without hesitation done what was required to meet war conditions. Thousands of men of all ages have been trained in our army and navy to meet any emergency and to overcome any obstacle without faltering. They have gone to war with a high heart, and they are coming back to tackle the remaining problems in the same spirit. To them nothing is impossible, for the impossible has been their daily task. The pessimist and the obstructionist will do well to stand out of their way.

A Clear Head

A steady hand to guide and control, a high heart to carry things through; these two are imperative. But there is still a third requisite, the directive mind. Foresight, a clear and logical brain, a broad vision: without these we will get nowhere. We have had too much of muddled thinking and irresponsible talking, too much of petty politics and narrow vision. Our leaders must be able to see beyond the expediency of the moment, must be able to visualize the world as it is to be, as well as the world as it is today.

This lack of vision, this failure to see the world movements, is a constant menace. The world has just gone through four and a half years of terrific struggle in proving that the independent sovereignty of one nation cannot exist where it runs athwart the good of humanity. Yet certain politicians are even now crying that entry into a League of Nations will endanger the sovereignty of this country. What is our sovereignty worth if it is to keep us from joining with other nations for the good of humanity? If our sovereignty is such as to be endangered by entry into the proposed League of Nations, it is a menace to humanity, and should not and cannot exist. These politicians fail utterly to see what world changes have taken place, their minds travel in the same narrow grooves in which they traveled five years ago. To them progress is nothing, politics everything. If such as these prevail all the struggle and sacrifice of the last four years will have been in vain.

But they will not prevail. There are too many clear-headed, far-sighted persons thinking and working for better things. They will call into play the vision and creative imagination which have heretofore been used in other channels. The engineer is accustomed to gazing at the tumbling river in the mountain wilderness and visualizing for himself the towering dam, the quiet lake, the power house, penstocks, and transmission lines which are to be the results of his labors. The manager can sit in his office and in his mind's eye see the results which will come from his policies. The salesman can look over his undeveloped territory, and see it dotted with contented users of his product. All these have the vision to see into the future, let them use this ability in the larger problems of the day.

There is need today in every industry and commercial activity and in politics, local national, and international, for a clear and broad vision, an optimistic heart, and a sure and steady hand. These are qualities which we like to ascribe in particular to the engineer and the manager. It is necessary for them, therefore, to rise to the occasion and to take a broad and active part in the affairs of the world. These are qualities which we have drilled into our men and women in the military service, the qualities which have enabled them to meet the emergencies of warfare. We can count on them, therefore, to exercise these qualities in the pursuits of reconstruction and reorganization.

The world was never more alive, never more powerful, and if we attack our problems with a steady hand, a high heart and a clear head, we need not fear for the ultimate outcome. The result is in our own hands.

RONALD T. STRONG

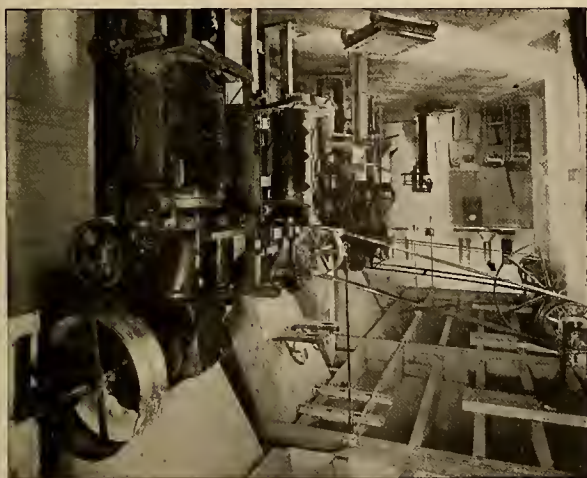
LATEST IN EVERYTHING ELECTRICAL

(Modern electrical equipment for an up-to-date flour mill is here illustrated and described, together with a specially designed annealing furnace, and a convenient plural plug socket.—The Editor.)

FLOUR MILL EQUIPMENT

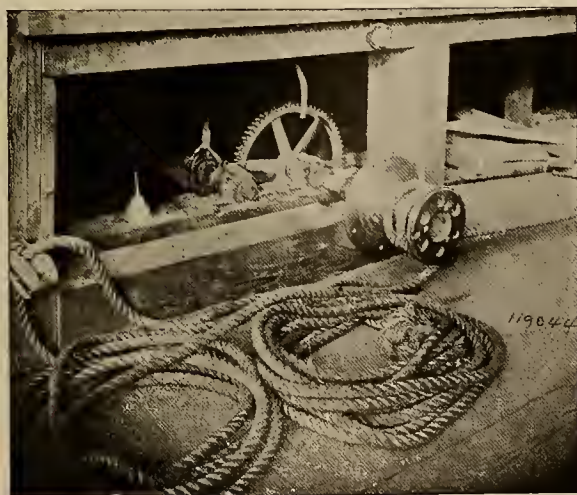
A very complete installation of modern machinery is in operation at the plant of the Pasco Flour Mill Company at Pasco, Washington.

All motors are equipped with the latest safety appliances to eliminate hazards from fire and insure safety in operation. Eight Westinghouse motors, ranging in size from 2 h.p. to 100 h.p., drive the machinery for the entire mill. The wiring for both power and light is in metal conduits.



Direct view of the two flour and two wheat packers

The wheat received for milling is handled directly from the cars to the elevators, while the transfer of wheat and flour to the warehouse is accomplished by electrically driven portable elevators.



Novel drum for moving cars on switch.—Drum is attached to counter shaft extension. The main shaft is driven by a 40 h.p. Westinghouse motor.

An unusual scheme is used to move cars on the switch, back and forth to different loading and unloading doors in the warehouse: A counter-shaft extension from the main shaft in the mill has a steel drum attached to the end that projects to the platform. Attached to this drum is a 1¼ inch rope which is hooked to the car intended for moving. The direction



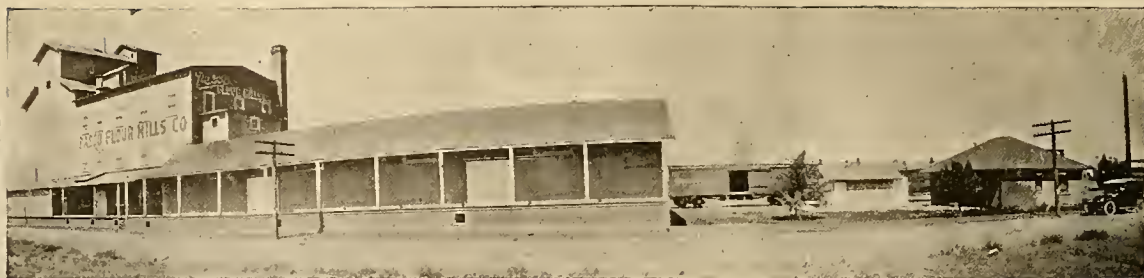
15 h.p. Type CS Westinghouse motor operating one No. 23 Prinz and Rau Separator, two stands of steel elevators and one 36 ft. 9 in. Conveyor



View of two No. 6 Monitor Scourers—capacity 200 bushels—and one Williams Grinder operated by a 40 h.p. slip ring CW Westinghouse motor.

of the pull from the drum is made by changing the wind of the rope on the drum. This scheme has increased the unloading capacity from four cars to six cars per day. From the same drum a power scoop is operated in unloading cars of bulk wheat into the bulk elevator hopper. Connected to the main shaft is a three-ton per hour steam barley roll with a cleaner and three elevators.

View of the Pasco Flour Mills Company
Pasco, Washington.



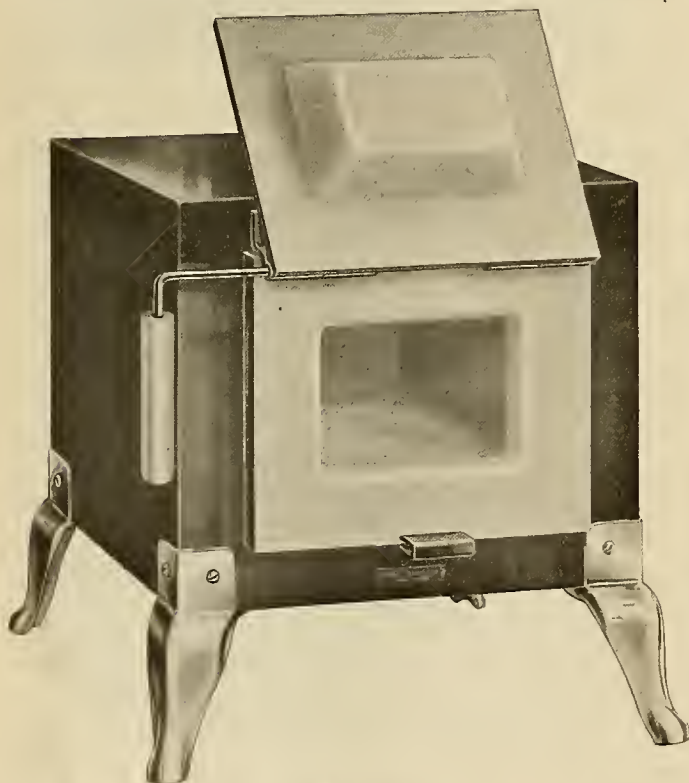
The plant is steam heated from a sixty horsepower high pressure boiler, which also furnishes heat for the office and warehouse.

When the company began to operate, all the piling of loaded wheat sacks or even empties was done by man power using a block and tackle. Since then they have installed a Piling Machine with which four men can pile 300 barrels of 140 jutes in four hours. This machine is operated by a 1-3 h.p. type Westinghouse motor.

A McCahey Sure Count Truck Counter is installed in the floor of the warehouse entrance, and is used to count the sacked wheat and flour coming into and going out of the warehouse. The truck on entering or leaving the warehouse runs over this counter, pressing a rod which is connected to an indicator, thus registering the load. This saves time and insures accuracy.

ELECTRIC FURNACES

A variety of electric furnaces for industrial purposes are being manufactured by the Edison Electric Appliance Company. The Annealing Furnace shown in the illustration



Annealing furnace

This end view shows the construction of the contact making members—the arc being broken horizontally rather than vertically

has been designed for treatment of carbon steels, for bluing, annealing and preheating high speed steel, where absence of scale or warping and elimination of dirt common to heating with gas or other fuels is an important consideration. This furnace is constructed to be of special value in work

where an exact control of temperature is essential for perfect results.

A PLURAL PLUG SOCKET

For facilitating the use of the various household electric appliances—reading lamp, toaster, fan, vacuum cleaner and so forth—a plural plug socket is invaluable, as it obviates the necessity of constantly removing the light bulbs. The Ajax Electric Specialty Company of St. Louis has manufactured for this purpose the Ajax Plural Plug Sockets. They are made of hard rubber composition, practically indestructible and impossible to get out of order. They can be connected to the regular fixture, leaving the lamp in its original position, and permitting the use of a shade.

Books and Bulletins

Principles of Radio-Telegraphy

By Cyril M. Jansky, B.S., B.A., Associate Professor of Electrical Engineering, University of Wisconsin. Size 6 x 9 in.; 242 pages. Published by McGraw-Hill Book Company, New York, and for sale by the Technical Book Shop, 171 Second St., San Francisco. Price \$2.00.

Beginning with two chapters on Magnetic Phenomena and Electrostatic Phenomena, the author takes up in full the principles and apparatus involved in electro-magnetism, and proceeds by logical stages to radio-telegraphy proper. The final chapters are devoted to practical appliances and methods in receiving and transmitting, with an additional chapter on the use of vacuum tubes in radio-telegraphy. The eleven chapters display a careful sense of organization, and their clear and adequate treatment of the subject is supported by numerous explanatory diagrams.

The Principles Underlying Radio Communication

Prepared by the Bureau of Standards under the direction of the office of the Chief Signal Officer of the Army Training Station. Size 4½ x 7 in.; 355 pages. Printed by the Government Printing Office, Washington, D. C., and obtainable from the Superintendent of Documents. Price 55 cents.

This book was prepared for the use of the Signal Corps in the rapid training of radio-electricians, but its brief, non-mathematical treatment renders it accessible to a wider public and of value to all, especially beginners, who are interested in this field. Text-books on this essentially modern and growing subject are necessarily of very recent development, designed to fill a very practical need of the present day.

McGraw Electric Railway List, February, 1919

By the Electric Railway Journal, published semi-annually. Size 4½ x 8½ in.; 273 pp. Published by McGraw-Hill Co., New York, and for sale by the Technical Book Shop, 171 Second St., San Francisco. Price \$4.00.

This publication is an invaluable work of reference. In the reports of the companies listed are included names of all officials, number of miles of track, power plant and sub-station equipment, and other important and inclusive data. The February issue contains a number of additions and improvements. The population changes have been brought up to date from the latest state figures and the numerical indexes to companies and individuals have been rearranged.

Lighting From Concealed Sources

The Engineering Department of the National X-Ray Reflector Company has recently put out a very attractive volume, "Lighting from Concealed Sources," the work of Chief Engineer J. L. Stain. It takes the form of a practical treatment of lighting systems, whether they be for church or ballroom, office or theatre, and is profusely illustrated with photographs and diagrams. Not the least of its virtues is the fact that it achieves a combination of the practical and artistic in a most important subject.

What Licked the Kaiser?

The Society for Electrical Development undertakes to answer this question, in a manner interesting to the electrical industry, in a booklet now being issued under the above title. The Society itself is achieving things of importance and is urging increased membership with a view to broadening its activities still further.

Bureau of Mines Bulletins

In Technical Paper 207 of this series, Henry Kreisinger, C. E. Augustine, and W. C. Harpster have compiled the results of a series of tests with fuel under the title "Combustion Experiments with North Dakota Lignite."

W. R. Hamilton contributes a paper on gas traps as agents of conservation, "Traps for Saving Gas at Oil Wells," Technical Paper 209. The author points out the particular application to which different types of traps apply, and discusses the effect upon oil and gas by various types, and the effect of their mechanical construction.

"Quarry Accidents in the United States during the Calendar Year 1917" is issued as Technical Paper 213.

"Boiler Water Treatment," Paper 218, is a reprint of Engineering Bulletin No. 3, prepared by the United States Fuel Administration in collaboration with the Bureau of Mines. It explains the action of hard water upon boilers, pointing out that waste of heat would be reduced by the substitution of softened water, and describing a number of processes by which this water-softening may be effected.

Technical Papers 219 and 221 are also reprints of Engineering Bulletins. The first, "Combustion and Flue Gas Analysis," advocates gas analysis as a means of detecting excess air and consequent waste in combustion, and describes the appliances used to regulate the consumption of fuel. The second, "Saving Steam in Industrial Heating Systems," deals with the utilization of steam for heating purposes.

"Notes on Lignite, Its Characteristics and Utilization," by S. M. Darling, is Paper 178 of this series.

Bulletin 166 of the Bureau of Mines, "A Preliminary Report on the Mining Districts of Idaho," is the work of Thomas Varley, Clarence A. Wright, Edgar K. Soper and Douglas C. Livingston. It describes the various mining districts in the state of Idaho, whether active or abandoned, and the nature and extent of the output in each.

A paper by P. H. Royster, "The Production of Spiegeleisen in Blast Furnaces," is published as No. 6 of the War Minerals Investigation Series.

Checking Pyrometers

A new bulletin just issued by Leeds & Northrup Company of Philadelphia, entitled "Checking Thermocouple Pyrometers," discusses the importance of maintaining standards and of checking in pyrometry. It points out sources of error and the remedies for troubles in thermocouples, millivoltmeters, cold junctions and potentiometers and outlines a commercial checking laboratory, including a special checking furnace, precision potentiometers and standardized thermocouples.

Electric Apparatus and Appliances

Schweitzer & Conrad have put out a very complete illustrated catalog of High Voltage Protective and Switching Equipment.

MacGovern and Company have listed in a folder their stock of Turbo-Units, Condenser Equipments, Motor Generator Sets and Rotary Converters.

A folder dealing with Rail Bonds has been sent out by the Ohio Brass Company.

The Magnavox Company is issuing descriptive bulletins concerning the Anti-Noise Telephone Apparatus.

The Edison Electric Appliance Company has sent out two very effective folders dealing with the Hotpoint Electrical Appliances and the General Electric Appliances.

The new catalog of the Ohio Brass Company is a handsome cloth-bound volume of 671 pages, profusely illustrated and elaborately cross-indexed. It presents a complete line of appliances used in the construction, maintenance and operation of Electric Railways, Mine Haulage Systems and Transmission Lines.

The Electric Washing Machine is the subject of a descriptive announcement issued by the Electric Appliance Company of San Francisco.

Preliminary Bulletin No. 113, illustrating and describing the Wheeler Steam Jet Air Pump, is now being distributed by the Wheeler Condenser & Engineering Company, Carteret, N. J.

Of interest to Roentgenologists is the announcement by Frank Rieber, chief engineer of the Roentgen Appliance Company, of a new complete line of Roentgen appliances now in preparation.

"C-H Molded Insulation" is an illustrated booklet issued by the Cutler-Hammer Manufacturing Company, describing their heat and fire-resisting insulations, Thermolax and Pyrolax.

The Geo. H. Gibson Company is distributing a bulletin descriptive of the Wheeler Steam Jet Air Pump.

Caterpillar War Service

"Caterpillar" tractors and their service in war time are the feature of the attractive April issue of The Caterpillar Times, published by The Holt Manufacturing Company.

University Bulletins

The Engineering Experiment Station of the University of Illinois issues as Bulletin 107 a paper by Miskishi, entitled "Analysis and Tests of Rigidly Connected Reinforced Concrete Frames."

Two other bulletins from the University of Illinois deal with the College of Engineers itself. Their titles, which are self-explanatory are, "A Discussion of the Development and Needs of the College of Engineering and the Engineering Experiment Station of the University of Illinois" and "The College of Engineering and Engineering Experiment Station," the latter being a pictorial description.

Miscellaneous

The Arizona Corporation Commission has issued its Sixth Annual Report, covering proceedings from July 1, 1917, to June 30, 1918.

"Lava for Mechanical and Electrical Purposes" is the title of an illustrated booklet issued by the American Lava Company.

John Wiley and Sons have issued their catalog of recent Technical and Scientific Books.

The Oregon Insurance Rating Bureau has issued a 1919 edition of "Wiring Data for Direct and Alternating Current Motors," compiled by F. D. Weber, Chief Electrical Engineer.

"Relation of Landslides and Glacial Deposits to Reservoir Sites" is the title of a report by W. W. Atwood, published as Bulletin 685 by the U. S. Geological Survey.

NEW ELECTRICAL DEVELOPMENTS

(Further particulars of the Skagit River municipal power project, some important new installations, and various bond issues for improvements are reported from the Northwest. A number of large plants are under construction in the Pacific Central District. The Southwest and Inter-Mountain Districts are both engaged in a variety of important light and power undertakings.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—The city council accepted the bid of William P. Harper & Son of \$147,465 for \$150,000 worth of municipal street railway bonds.

TACOMA, WASH.—Lighting of the city hall tower by the flood light system instead of the outline globe illumination now used has been virtually decided upon by the city commissioners.

SEATTLE, WASH.—The University Club has decided to hold a street carnival July 1 to 5. The proceeds of the carnival will be used to purchase cluster lights for 14th Avenue, Northwest.

VICTORIA, B. C.—The British Columbia Electric Railway is planning to lay a submarine cable across Victoria Harbor to supply electricity for industrial purposes on the Songhees Indian Reserve.

ASTORIA, ORE.—The Astoria Marine Works are planning to build a marine railroad, authorized some time ago by the Emergency Shipping Board, to cost about \$500,000. All equipment will be electrically operated.

SPOKANE, WASH.—According to Mayor C. M. Fassett of Spokane, no franchise will be granted by the city council to a consolidated traction company unless it contains a provision for municipal ownership.

EUGENE, ORE.—The Willamette division of the Mountain States Power Company has secured a contract with the Huber Construction Company for 75 horsepower in motors for the operation of a rock crusher near Lewisburg.

TACOMA, WASH.—It is announced by city officials that the way has been cleared for the purchase by the city of the Lake Cushman power site and that the proposition of purchasing the 8,000 acres will be submitted to the voters some time in June.

SEATTLE, WASH.—Issuance and sale of \$790,000 utility bonds for extensions and betterments to the municipal street railway system is provided for by an ordinance recently passed by the city council and sent to the acting mayor for signature.

TACOMA, WASH.—Indicating that a valuation of \$7,500,000 is placed on its property, the Tacoma street railway organization, through its manager, Louis H. Bean, has started what is considered a propaganda for the sale of the Tacoma Railway & Power Company interests to the city.

TACOMA, WASH.—A hearing was held before the board of state land commissioners on a petition by the Skokomish Power Company and the city of Tacoma for an extension of time within which to commence work on the construction of a water power plant on the North Fork of the Skokomish River, in Mason county.

SALEM, ORE.—The contract for the Valley Packing Company's plant, to be erected just north of the city by Steusloff and Cross, was awarded to F. J. Leonard of Portland. An independent water supply system will be installed to supply the buildings and stock yards. Electrical power will be used throughout the plant.

HOQUIAM, WASH.—J. Johnson, head of the Western Rolling Mill Corporation, announces that work on the plant will be started at an early date. An open hearth furnace will be installed first and this is to be followed by the installation of an electric furnace. The plant is to have a capacity of 100 tons of steel daily.

PORT ANGELES, WASH.—The Puget Sound Bridge & Dredging Company has awarded the contract for rebuilding the entire electrical machinery at its plant, recently destroyed by fire, to Thompson & Castleton, electrical engineers, 316 First Avenue South, Seattle. The equipment will include a 650-h.p. motor and starting apparatus.

OLYMPIA, WASH.—Representatives of southwestern Washington cities met recently and formed commercial organizations for the purpose of promoting construction of the proposed ship canal from Puget Sound to Grays Harbor. The organization plans include also the construction of a comprehensive series of inland waterways along the lower Columbia.

VANCOUVER, WASH.—Some 9000 acres of overflow land along the Columbia River will be reclaimed by a diking project now being inaugurated by the county commissioners of Clarke county. G. J. Proysky of Kelso, Wash., has been appointed engineer. Vancouver lake, covering several thousand acres, will be drained in connection with the project.

PENDLETON, ORE.—Efforts are to be made to put through the project for the construction of a reservoir on McKay Creek to supply additional water to the lands of the west end of the county. The dam, which would cost in the neighborhood of \$2,000,600, would impound water during the rainy season to be let down the creek and the river during the summer months to supplement the present supply.

SEATTLE, WASH.—Trainmen employed on the municipal street railway system in Seattle will hereafter receive pay for overtime at the rate of $1\frac{1}{2}$ the regular pay, the city council having passed an ordinance to that effect. An appropriation of \$5,000 was made by the council to meet overtime payments under the ordinance from May 15 to June 1. This action of the council prevented a strike on the city lines.

VERNON, B. C.—The city council of Vernon, B. C., have found it necessary to increase the lighting rates. Commencing May 1st the rate will be 14 cents for the first 100 kw-hr.; 13 cents for the next 100 kw-hr.; 12 cents for the next 300 kw-hr., and 11 cents for all over that, subject to a discount of 20 per cent if paid before the 15th of each month. The old rate was 12 cents up to 500 kw-hr., with a similar discount.

WENATCHEE, WASH.—The organization of the Whitestone Horse Spring Coulee Irrigation District has now been formally completed and the issue of \$700,000 worth of bonds will probably be offered for sale as soon as the State Reclamation Board passes upon the project. It is proposed to construct a dam in Toates Coulee Creek, and water sufficient to irrigate 12,000 acres of land lying opposite Tonasket will be stored and brought down for use during the season.

SEATTLE, WASH.—A report by D. C. Henny of Portland and C. F. Uhden of Spokane, on the Skagit River municipal power project, has been submitted to the city council by City Engineer A. H. Dimock. The report advocates a concrete diversion dam near Gorge Creek, and a high storage and power development in Ruby Canyon. At a meeting of the utilities committee of the city council held May 1st, City Engineer Dimock stated that a power plant capable of producing 35,000 kilowatts of electrical en-

ergy can be constructed on the Skagit River near the mouth of Gorge Creek with the proceeds of the \$5,500,000 bond issue authorized by the city council for Skagit development purposes.

THE PACIFIC CENTRAL DISTRICT

SAN BERNARDINO, CAL.—The construction of a new electric power plant to replace the one recently destroyed by fire is under consideration by the Yellow Pine Mining Company.

REDDING, CAL.—The Pacific Gas & Electric Company, the Northern California Power Company and the Pit River Power Company each has a power development project under way on Pit River.

PETALUMA, CAL.—The city council accepted the bid of the Petaluma-Santa Rosa Electric Railroad Company for a franchise to construct an interurban railroad on the west bank of the Petaluma River.

HOLLISTER, CAL.—The Board of Supervisors has granted the Coast Counties Gas & Electric Company of Santa Cruz a franchise to erect and operate electric transmission lines on the county roads and public highways.

SAN JUAN, CAL.—The Sierra & San Francisco Power Company is building a substation just east of the California Central Railroad. The station is being built to supply power to the Coast Counties Gas & Electric Company.

OAKDALE, CAL.—The Sierra & San Francisco Power Company has plans for greatly enlarging its reservoir supply, and General Manager H. F. Jackson has recently returned from a visit to proposed sites of new reservoirs.

CHICO, CAL.—Work will be started next month by the Pacific Gas & Electric Company on a new \$25,000 Jones gas set which will be installed in a new building to be erected as an extension in the present plant at Second and Cherry streets.

SACRAMENTO, CAL.—A. E. Rhodes, general agent of the California Traction Company, has announced that instead of the two-man car the company is now using, it will in the course of a few days inaugurate a one-man car service on its local lines.

VALLEJO, CAL.—Naval officials at the Mare Island navy yard were authorized to proceed with the work of erecting a new power plant at the navy coaling depot at California City, the project to cost the government approximately \$20,000.

SAN FRANCISCO, CAL.—Application has been made to the State Water Commission by Roy M. Pike to appropriate water from the San Joaquin River, Stanislaus county, for irrigation. Three consecutive pumping stations are planned, the plant to cost about \$80,000.

SAN FRANCISCO, CAL.—The Sierra Electric Company has incorporated here with a capital stock of \$15,000; 150 shares at \$100 each; amount subscribed, \$500. The subscribers are: M. W. Bode, Walter Van Winkle, A. B. Weiler, H. H. Van Laven and Frank I. Du Frane.

FRESNO, CAL.—Preparations are being made by the California Associated Raisin Company of Fresno for the erection of a new plant here, to cost about \$750,000. Considerable electrical and mechanical equipment, conveyor systems, packing machinery, etc., will be installed.

SAN FRANCISCO, CAL.—The Pacific Power & Light Company announces through the Lumbermen's Trust Company, San Francisco, that

the regular quarterly dividend of 1½ per cent has been declared on the preferred stock of the company, and is payable May 1, 1919, to holders of record at the close of business April 22, 1919.

MARE ISLAND, CAL.—Improvements have been authorized by the Bureau of Yards and Docks, Navy Department, Washington, D. C., to the Mare Island Navy Yard, including slips and piers, doubling the capacity of power plant, new buildings, oil tanks and railway through Vallejo causeway to connect with the Southern Pacific Railway.

SAN FRANCISCO, CAL.—John A. Britton, General Manager of the Pacific Gas & Electric Company, stated before the Railroad Commission that his company will probably expend \$2,000,000 in the purchase of additional land and power sites if Congress passes the land-leasing bill. The company is desirous of guarding against such conditions as were brought about by the hydroelectric shortage resulting from last year's subnormal rainfall.

SAN FRANCISCO, CAL.—The Board of Supervisors authorized the Board of Public Works to receive bids and enter into contract for relocating the Union Street line of the Municipal Railroad from Franklin and Union streets to Van Ness avenue; installing trolley poles and wires on Union street from Franklin street to Van Ness avenue at an estimated cost of \$22,000. The proposed improvement will eliminate two curves and straighten out the line.

MONTEREY, CAL.—The Del Monte Light & Power Company, recently incorporated, has petitioned the State Railroad Commission for permission to issue \$25,000 in capital stock for the purpose of purchasing from the Pacific Improvement Company its electric transmission system in Monterey county. The line has been appraised at \$26,967. The Del Monte company proposes to purchase energy from the Coast Valleys Gas & Electric Company.

PORTERVILLE, CAL.—Work has started at Richgrove, south of here, on an extensive improvement for the system of the Mt. Whitney Power & Electric Company. A temporary warehouse has been built and supplies are now being assembled for a new substation, the purpose of which will be to furnish another addition to the several auxiliary plants by which power users in this district can be served. The service wires will lead to the new station from the Kern River plant over the Greenhorn mountains.

FRESNO, CAL.—The San Joaquin Light & Power Corporation has applied to the Railroad Commission for permission to issue \$1,000,000 par value of its 6 per cent ten-year series B debentures. An agreement has been made for the sale of the debentures. The funds are to reimburse the company for expenditures for betterments and extensions made subsequent to January 1, 1917. According to a financial statement filed with the petition the company has outstanding \$6,500,000 preferred stock and \$11,000,000 common stock. Since and including 1913, the company has paid dividends every year excepting 1915 and 1916.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—An election to vote on establishing a lighting district in Lamanda Park will be held July 1st.

PHOENIX, ARIZ.—The Water Users' Association has been granted permission to construct a power line along Washington street.

MESA, ARIZ.—The Water Users' Association is to remodel the power portion of the Chaidler steam generation plant, 1½ miles northwest of Mesa, and will add another power production unit to the electric system.

BRAWLEY, CAL.—The long distance service between Los Angeles and Brawley will be greatly improved, as announced by Manager Bryant of the local office. Two new toll line circuits are to be installed, to go by way of San Diego.

FILLMORE, CAL.—Fillmore is assured that gas for domestic purposes will be furnished in less than four months' time. The trustees have granted a franchise to the Southern Counties Gas Company for furnishing gas for light and heat for a period of 30 years, from May 5, 1919.

LOS ANGELES, CAL.—F. Clyde Power has applied to the State Water Commission for permission to appropriate water from Bucks and Grizzly creeks, Plumas county, for generating electricity for power purposes. The power is to be applied to mining and manufacturing projects.

CARLSBAD, N. M.—The property of the Carlsbad Light & Power Company, it is reported, has been purchased by Chicago capitalists. The new owners will operate an ice factory and laundry. The dam will be enlarged and new machinery will be installed at the power house.

MESA, ARIZ.—The city council has decided to call an election for voting on a bond issue for \$100,000, for the purpose of financing city improvements. These include a gas plant, additional electric equipment and power extension, and improvement to the water system; also a fire-house, and a warehouse for city supplies.

SAN DIEGO, CAL.—The Railroad Commission of California has just handed down a decision which increases the gas and electric rates of the San Diego Consolidated Gas & Electric Company approximately 10%. The decision, which is effective as of May 1st, amounts to a general division of the company's rates. The new gas rate is established as a permanent schedule.

LOS ANGELES, CAL.—Mayor T. Woodman, together with members of the city council and the legal and engineering staffs of the city, has approved the purchase of the entire distributing system of the Southern California Edison Company for \$11,000,000. At the close of the conference of officers of the State Railroad Commission there was an unanimous authorization for the drafting of a contract enabling the city to make the purchase. A bond issue will be put up to the people.

GLENDALE, CAL.—The following contracts have been awarded by the Board of Public Service: cable and wire to the Standard Underground Cable Company; cable terminals to Charles Farnham; disconnecting switches and pole line oil switch to the Kelman Electric & Manufacturing Company; year's supply of meters to the Westinghouse Electric & Manufacturing Company; year's supply of transformers to the General Electric Company; connectors and 1500 volt insulators to the Garland-Affolter Company.

THE INTER-MOUNTAIN DISTRICT

SALMON, IDAHO.—The Harmony Mines Company is planning to erect an electric transmission line to connect with the Salmon River power plant. E. F. Nieman is general superintendent of the company.

BRIGHAM CITY, UTAH.—Actual construction work on the new street lighting system for this city will be started at once, according to a decision of the city council.

DENVER, COLO.—Plans are being prepared in the Denver offices of the United States Reclamation Service for the proposed diversion dam in Lost River and head works of "J" canal, Klamath irrigation project.

BLACKFOOT, IDAHO.—The State Board of Equalization of Idaho have set aside four days in August during which they will devote their entire time to hearing from the public utilities of the state, whose property is subject to assessment by the Board of Equalization.

OGDEN, UTAH.—Engineers of the Telluride Power Company are conferring with the Forestry engineers in an effort to secure permission to establish a power plant in one of the national forests in southern Utah where the company

operates. No action has been taken on the request as yet.

SALT LAKE CITY, UTAH.—A decree of foreclosure, involving all the rights and titles of the Delta Land & Water Company, covering two irrigation projects in the counties of Millard and Beaver, and many thousands of acres, totaling more than \$1,000,000, has been made by the United States District Court.

HEBER CITY, UTAH.—Municipal Power Plant officials of this city, together with officers of the Timpanogas Irrigation Company, are considering means of upkeep of the water flume which serves the city power plant and the irrigation company. The flume is in bad shape and will probably have to be rebuilt.

DOWNEY, IDAHO.—Members of the Commercial Club and other prominent citizens are making an effort to secure pledges for \$30,000 worth of Utah Power & Light Company's preferred stock, to enable the company to extend its high tension line into the Marsh Valley, thus providing twenty-four hour service for Downey and with sufficient capacity to stimulate industrial activity in the community.

ASHTON, IDAHO.—A special meeting of the board of trustees of this city was held May 9 to consider the validity of the contract recently entered into by the board for street lighting with the Ashton-St. Anthony Power Company. Opposition has been raised to the contract on the ground that it is illegal for the reason that some members of the board of trustees are also stockholders in the Ashton-St. Anthony Power Company. No decision was reached and the matter will be further considered at a later meeting.

TWIN FALLS, IDAHO.—Organization of a farmers' mutual light, heat and power company with a capitalization of \$500,000, to take over the interests of the mutual company organized here some months ago and to proceed with the plans for the development of the Clear Lakes power site on Snake River, north of Buhl, furnishing current to Buhl and Clover and tributary rural districts, is a project well under way, according to information given out by the promoters of the plan, including J. A. Crom, J. W. Hayes and D. M. Denton.

ST. GEORGE, UTAH.—The Dixie Power Company has filed application with the State Engineer for permission to take 25 second-feet of water from Santa Clara Creek at a point north of Foster in the Dixie National Forest. This will be diverted by means of a crib dam and carried ¾ miles in a canal and flume and utilized under a 314-ft. head with two 50-in. Pelton waterwheels, developing 712 h.p. The company already has a plant on Santa Clara Creek.

DELTA, UTAH.—The application of the Deseret Irrigation Company and the Melville Irrigation Company for a certificate of convenience and necessity in the supplying of electric power and light to several towns in Millard county was filed with the Public Utilities Commission recently. The companies assert they intend to build a second plant for electric power production near Delta on the Sevier River, having already a plant in operation at Oasis. If permit is granted they expect to supply electricity to the towns of Delta, Oasis, Desert and Hinkley.

ST. GEORGE, UTAH.—The Dixie Power Company, which serves a number of towns in southwestern Utah, will hold a meeting in Salt Lake City on May 30th, for the purpose of voting on a proposition to increase the capital stock to an amount not exceeding \$1,000,000, providing that part of this capital shall be preferred seven per cent cumulative dividend stock; to consider the proposition of retiring the present outstanding mortgage and of issuing a new series of bonds not exceeding \$500,000; and to ratify the purchase of the Cedar City electric plant.

THE VACUUM CLEANER — THE VACUUM CLEANER

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A COLLAR BUTTON is a small thing, but a man who tries to complete his evening dress without one is convinced of its importance. The elements which go to make up this page of "incidentals" are none of them large or outwardly conspicuous, but their value is not to be judged by the mere matter of size. They represent the human items which go to make life whole and sane and as such are not to be neglected. The office Vacuum Cleaner spends its time collecting these smaller objects—and is here permitted to display them at semi-monthly intervals. The results are uncensored.—The Editor.



Echoes from the Coronado Convention are still being heard. Here is one such by the recognized laureate of electrical industry in the West. It is designed to make those who weren't there wish they had been and those who were, wish they were back.

I've danced 'till my feet are tired,
I've drunk 'till my throat is sore.
I've tramped on the beach within easy reach
A hundred times or more.
I've sat on the broad verandas,
I've looked at girls that are fair,
I've flirted with some, I've heard the hum
Of flying machines in mid-air.
I've fed in a room like a circle,
Large as the state of Maine;
I've taken on fat, but why speak of that—
Just look at my broad mezzanine.
I've played all night in the offing
At indoor sports I know;
I've won and lost, and counted the cost
Of beating both friend and foe.
I've been a regular feller,
I've spent both strength and kale.
Of one thing I'm sure—I've found the cure
For living without shortening sail.
I've come to El Coronado
Crown village near to the sea.
But listen, you Crab, and this idea Grab,
We've met—and that satisfies me.

ALBERT H. ELLIOT.

A Hold-up in Mexico was evidently the occasion for this picture. These highbinders look desperate enough to be true but—s-sh!—we will let you into the secret—as a matter of fact they are, reading from left to right: Jackson the chauffeur, Freddie Skeels, western manager of the Crouse Hinds Company, Harry Kirkland, sales manager of the American Conduit Manufacturing Company, and W. M. Deming, president and general manager of the Technical Publishing Company, publishers of the Journal of Electricity. The lady behind the gun is Mrs. W. L. Goodwin, wife of the well known founder of the Goodwin Plan.



BURIAL OF JOHN BARLEYCORN

BY A. H. HALLORAN

Friends, Rumhounds, Electrical Men, lend me your ears!
I come to bury John Barleycorn, not to praise him,
For that task belongs to those who knew him better e'en than I.
The evil that men do lives after them,
Like the head-ache that comes the morning after—
The good is oft distilled when they are cremated.
So let it be with John Barleycorn. The Prohibitionist
Hath told you that John gave men cheer;
If it were so, were it such a grievous fault?
You all did love him once, not without cause,
What cause withholds you then to mourn him?
But yesterday the power of John Barleycorn might
Have stood against the world. Now lies he in his bier
And none so rich might buy himself a stein.
If you have toasts, prepare to drink them now,
For after July first no more can you slake that thirst.
You all know this bottle. I remember the first time ever I drank
from it.

It was on a summer's evening in this hotel
That night I overcame the nerviest.
Look, in this place Carrie Nation's hatchet struck.
See what a rent the envious Gandier made.
Through here the well-beloved Bryan stabbed.
Oh, this is the most unkindest cut of all!

Good friends, sweet friends, let me not stir you up
To any sudden flood of mutiny.
They that have done this deed are honorable.
What private booze they have, alas, I know not.
What made them do it? They are wise and honorable
And will no doubt with reason answer you.
I have neither wit, nor words nor worth,
Action or utterance or the power of speech. But were I soured
Or even pickled, there were an orator
Would ruffle up your spirits, and put a tongue
In every empty glass that should move
Every one of you to rise and mutiny.

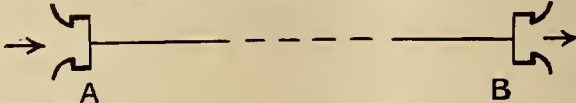
"It is awfully easy to be boss, but it is awfully hard to be the right kind of a boss," as expressed by B. M. Merrill of the Washington Water Power Company at Spokane. How about it?

The Mistakes in Life are listed by Judge McCormick of San Francisco as thirteen. Here they are:

1. To attempt to set up your own standards of right and wrong.
2. To try to measure the enjoyment of others by your own.
3. To expect uniformity of opinions in this world.
4. To fail to make allowances for inexperience.
5. To endeavor to mold all dispositions alike.
6. Not to yield to unimportant trifles.
7. To look for perfection in our own actions.
8. To worry ourselves and others about what cannot be remedied.
9. Not to help everybody, wherever, however and whenever we can.
10. To consider anything impossible that we cannot perform ourselves.
11. To believe only what our finite minds can grasp.
12. Not to make allowances for the weaknesses of others.
13. To estimate by some outside quality when it is that within which makes the man.

ENGINEERS OF YESTERDAY—10. HOOKE

(A Series Compiled by A. L. Jordan)



What was the date of invention of the telephone?
The electric telephone was invented in 1876, but the acoustic or "string" telephone was brought out by Robert Hooke, an Englishman, in about 1660, over two hundred years earlier. In the latter instrument, unlike the former, the motions of the disc at A, produced by the voice, are transmitted through the string or wire and at B reproduce the original vibrations. It is limited in distance, however, to a mile or so. Hooke also discovered, with the aid of the microscope, the cellular nature of living things in 1665, and in 1676 made known the great law for elastic solids: The restoring force, when any elastic solid is changed by bending, stretching, compression or twisting, is proportional to that change.

JOURNAL OF ELECTRICITY

VOL. 42. NO. 12.

SAN FRANCISCO, JUNE 15, 1919

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more

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Bulls-eyes



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Has ebonized, always-cool handle.

Toaster and Toast Rack made of steel; polished nickel finish. The Toaster is of a new design, sturdy and ornamental.

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Made of pressed steel, finished in highly polished nickel.

Has deep under-dish with broiling grid; shallow dish; cover to fit either dish; serves as reflector or cake griddle; cord, lampsocket attachment plug and composition switch-plug.

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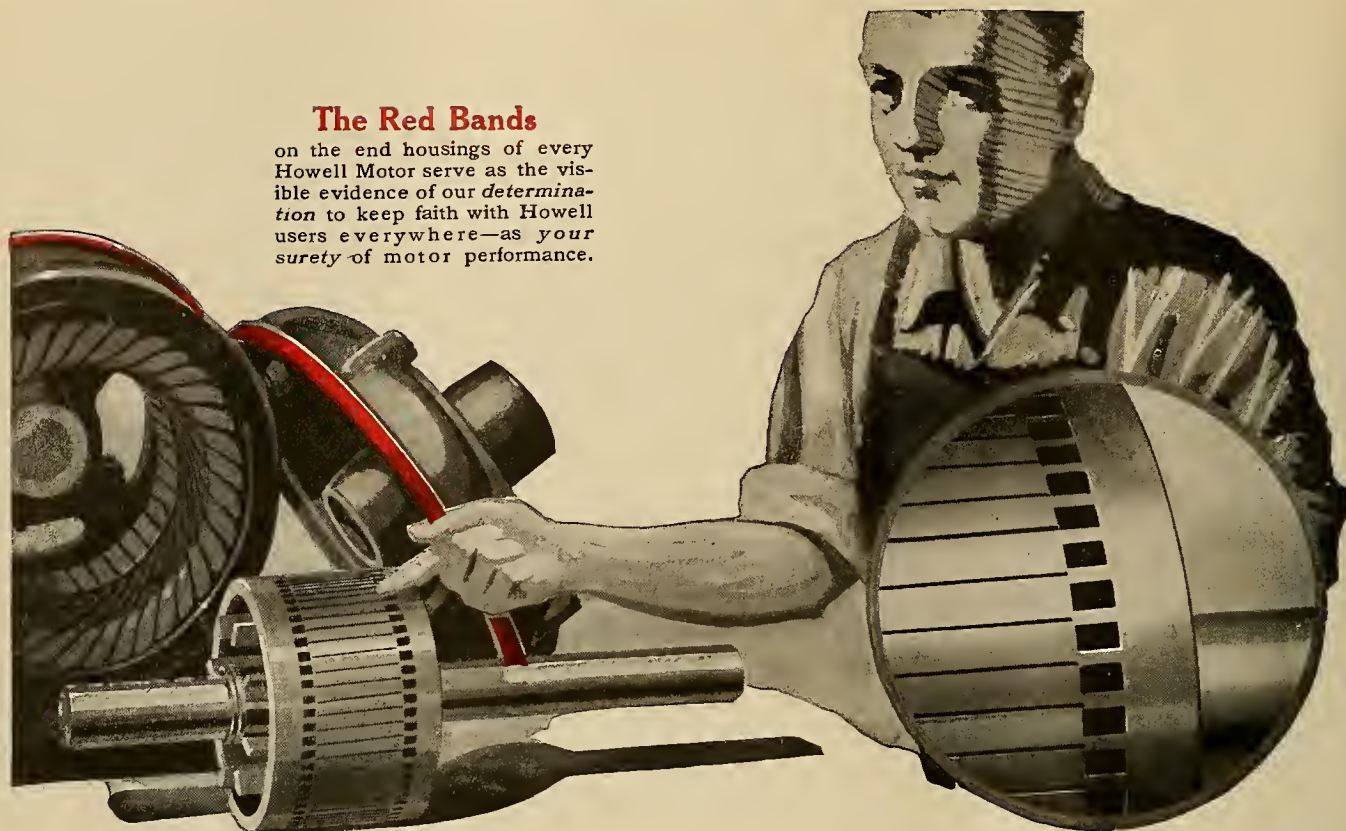
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JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

CLOTILDE GRUNSKY, Associate

VOLUME 42

SAN FRANCISCO, JUNE 15, 1919

NUMBER 12

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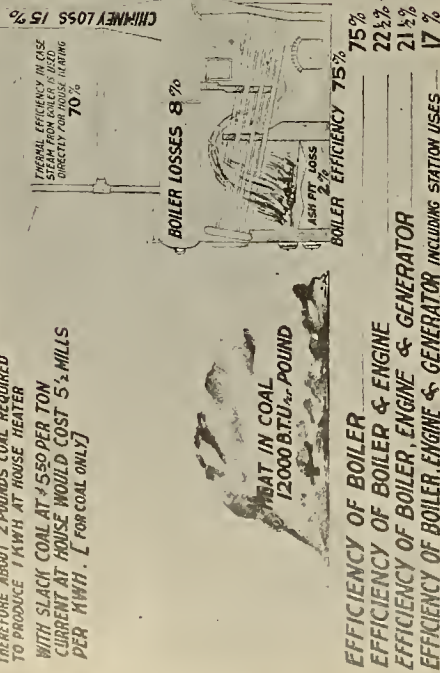
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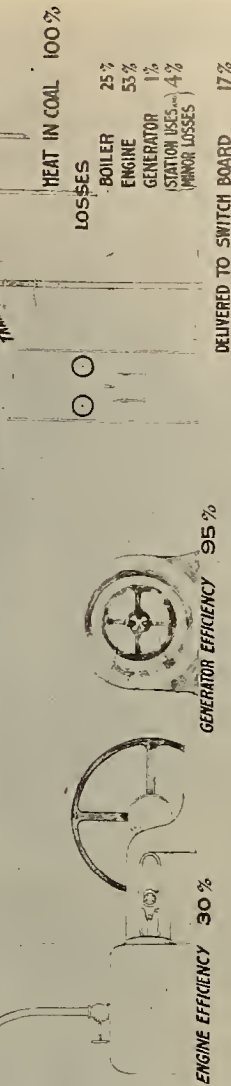
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EFFICIENCY COAL PILE TO ELECTRIC HEATER IN HOUSE 13 1/2 %

1 POUND OF COAL = 12,000 B.T.U.
 13 1/2 % X 12,000 B.T.U. = 1620 B.T.U.
 THEREFORE, ABOUT 2 POUNDS COAL REQUIRED
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 CURRENT AT HOUSE WOULD COST 5 1/2 MILLS
 PER KWH. (FOR COAL ONLY)



LOSS BY CONVERTING INTO ELECTRICAL ENERGY FOR HEATING PURPOSES INSTEAD OF USING HEAT OF COAL DIRECTLY 56 1/2 %



THE FUTURE OF THE ELECTRIC HEATING OF HOUSES in general is not to be judged from the uniquely favorable experience of the heating service inaugurated on the Minidoka project, which was described at some length in an article in the Journal of Electricity of February 1st. This article has been extensively reprinted, however, and so many inquiries have come in to this office from outside sources which indicate a possibly too hopeful attitude toward the future of electric heating, that it seems only just in some measure to correct the impression. It is not probable that there will ever be a general heating of homes by electricity. All the water power available in the United States today would not furnish enough energy to heat the homes and office buildings of this area as they are now heated by coal and oil,—not to mention providing as well for light and general power demands. It would not pay to transform coal into electric energy and then again into heat, as is indicated by the chart of losses here shown which was prepared by Prof. J. F. Merrill for use before the Idaho Public Utilities Commission. The direct use of coal for house heating in stoves and furnaces is far more efficient and results in an actual saving of fuel. This is not to deny that exceptions are possible. Where a power company is provided with a purely summer load, as in the case of the irrigation pumping plant referred to, a heating service to the extent of the available power is a profitable possibility. In communities where there is much excess water power, a limited heating service may help to fill in valleys to the extent of this excess. So large is the heating demand for even small installations, however, that it is not probable this service could be extended to the community at large, or it would soon cease to become an auxiliary load and would absorb the main output of the power company. The two sides of this question, as they have been worked out in the Northwest, are ably presented in the articles by V. H. Greisser and J. D. Ross appearing elsewhere in this issue.



JOURNAL OF ELECTRICITY



DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST
AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

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TO THE AMERICAN BOY

IN RECOGNITION OF HIS STURDY PATRIOTISM AND THE WORTH OF HIS ENTHUSIASTICALLY RENDERED WAR SERVICE, THE BOY SCOUT WEEK OF JUNE 8TH TO JUNE 14TH WAS DEDICATED. MISCHIEF, PROMISE, GOOD INTENTIONS, ROMANTIC IDEALISM AND OUTWARD SCORN—JUST BOY—IN HIM LIES ALL THE HOPE WE HAVE. WHAT ARE YOU DOING TO HELP THE BOYS OF YOUR COMMUNITY?

Not since the thrilling pre-exposition days of the Panama-Pacific Exposition has such enthusiasm pervaded the West in matters electrical as is today manifest on all sides.

1920—the Year of Years in the West

The announcement of the National Electric Light Association at Atlantic City, in recent convention assembled, to the effect that the next gathering will be held in Los Angeles, has met with cordial and enthusiastic response from all sections of the West.

It is most generally conceded that in the district west of the Rocky Mountains the method electrical has developed to a degree nowhere else in the world attained today. With recent census statistics pointing out an intensive use of electricity per capita, four times that of the district east of the Rockies, and an undeveloped potential water power of twice that of the remainder of the nation, the setting for the 1920 convention could hardly be more fortunately chosen.

Already men of the industry in the West are planning to make this great gathering one long to be remembered in the annals of the electrical industry.

While it is too early to definitely formulate the program in detail, the consensus of opinion seems to favor the holding of the first day's session of the convention at Los Angeles as a special setting for the Pacific Coast Section, N. E. L. A., in which the national membership will be invited to participate, and then later to turn over the sessions to the national organization, thus making possible the keeping alive of individuality in the West for the Pacific Coast Section and at the same time making possible an introduction of our eastern visitors to some of the unique problems here encountered and the progressive manner in which they are attacked.

It is also suggested on all sides that entertainment features both for pleasure and for instruction be undertaken on a far more extended scale than ever before attempted. It is proposed that the entire state of California—known the world over as the most wonderful and enjoyable outdoor exhibit in

existence—be made possible for visitation and inspection.

To this end some of our model contractor-dealer stores, where the California Electrical Cooperative Campaign has worked such wonders, will be put on exhibit. Our water power developments and our vast systems of interconnection will be made easy of access both by automobile and, for the more adventurous, by aeroplane.

The recent Coronado conventions, to which many journeyed by automobile from San Francisco, have demonstrated the delight and profit to be derived by auto. As a consequence on all sides it is believed that auto and aeroplane will in 1920 make possible a National Electric Light Association convention which for instruction and enjoyment has never before been equaled. And in this instruction and enjoyment it is safe to prophesy that California's famous highways, her grand gorges such as the Yosemite, and her progressive enterprise in methods electrical will remain in vision to all beholders years after attendance at these sessions.

The plan of the National Association of Electrical Contractors and Dealers for the establishment of a "Bureau of Education and Research" holds the possibility of becoming one of the most important factors in the advancement of the electrical industry. In brief, it calls for a nation wide campaign directed toward the improving and increasing of the retail distribution of electrical merchandise. As outlined by W. L. Goodwin, on his recent Western visit, it deserves unqualified support.

As originally organized, the plan called for the financing of the campaign by contributions from jobbers, manufacturers and central stations on the basis of every \$1000 of resale material (or current) sold, a minimum subscription to be \$50, maximum \$10,000. As we understand the plan today, no subscriptions are to be asked of central stations now supporting local campaigns—and the brunt of the

expense is to be borne by the national manufacturers and distributors. The money is to be expended on the basis of district membership in the National Association of Electrical Contractors and Dealers, through a committee of three appointed from that organization. Back of that body is to be an Advisory Committee representing other branches of the industry who, Mr. Goodwin states, will have the direction of policies and final say as to expenditures.

The magnitude of the plan is to be seen in the fact that the fund is aimed to reach \$100,000—indeed, if it receives adequate support from the industry it may far exceed that sum. Of course a full contribution is not to be expected, but by comparison with the needs of the California Electrical Cooperative Campaign, whose fund for one state alone amounts to some \$18,000 yearly, it is to be seen that if anything like an effective campaign is to be carried on through forty-eight states of the Union, several hundred thousands would be needed for the work.

The West is peculiarly interested in such a plan, for the reason that the experiment has here been tried out on a state-wide scale. The California Electrical Cooperative Campaign has now been successfully operating for almost two years with very practical results in good feeling and actually increased sales through better merchandising methods. The supporters of this movement would not be in favor of any plan which would endanger these results.

As it has been explained by Mr. Goodwin, however, the proposed bureau does not contemplate covering any territory already adequately provided for, nor the asking of support from those who are carrying on local movements. On the contrary, the forming of local cooperative organizations which will carry on the local field work is to be fostered wherever possible, the national bureau to serve as an inspiration and clearing house—and to carry on supplementary work in districts not yet advanced to this point. This is a wise development of the proposed plan. With perfect confidence in the high motives and ability of the committee, it would have been difficult for any centralized group to understand and meet problems of nation-wide divergence. A bureau conducted purely from above is in danger of degenerating into merely another source of printed matter.

The present plan provides for these dangers, however, and as here outlined, deserves most hearty support. The possibilities of cooperative campaigns are to be judged by the unqualified success of our Western experiment. For all parts of the country to enjoy similar benefits would be one of the greatest steps forward the industry could take.

The cooperation of the electrical industry is being asked in the formation of a code of safety

Safety Orders and the Underwriters Code

rulings for the State of California to combine the Electric Utilization Safety Orders now issued by the Industrial Accident Commission and the Fire Code of the Board of Fire Underwriters in a revised form which will be rec-

ognized by the state as a ruling of the Industrial Accident Commission.

The problem is to be put squarely up to the electrical men themselves. It is proposed to form a committee of manufacturers' representatives and delegates from the N. E. L. A., A. I. E. E. and California Employers' Association—in fact representative of all who manufacture, install or use electrical materials. To this end, a meeting of electrical manufacturers is called on June 15th in the rooms of the Industrial Accident Commission where four representatives are to be chosen for this branch.

It is to be hoped that the electrical industry will respond to this call. The commission has adopted the broad-minded policy of opening all proposed legislation to full discussion before its initiation. In this matter, as well as in the contractor's license bill which was held over from this legislature to permit wider consideration, it is the responsibility of the electrical man to keep in touch with what is going on and assist in the formulation of policies. The action of the commission in this respect is much to be commended—it is to be hoped the electrical industry will take advantage of the privilege offered them.

The president of the California Association of Electrical Contractors and Dealers has ably sounded the keynote for the forthcoming Santa Cruz convention the latter part of this month when he states, as appears in his annual address on other pages of this issue, that the central station is the "core" around which the whole electrical industry is wound. The excellent work that is being accomplished by the California Association is well reflected in the growing confidence the public is acquiring in the progressive manner in which utility affairs are being handled in the West. The contractor-dealer has it within his power to vastly spread the good word among the people at large and in this work the Association in California is performing yeoman service.

A new variation in the effective extension service conducted by the state universities of the West is found in the series of

A Suggested Vacation Service

Le Conte memorial lectures which are to be delivered in Yosemite Valley during June and July, 1919.

These are to be free to the public and will cover such subjects as the botanical features of the valley, the geologic history of Yosemite, the life and services of John Muir, as well as Indian folk lore associated with the region.

The subjects chosen are highly commendable, but why not also a lecture on the water power possibilities of the West and of this region? Perhaps nowhere in the world is there a more varied display of water falls than is to be found in the eight mile length of this valley—and the Yosemite tourist is always greatly interested in the extensive use of electricity in this high mountain summer community, made possible by the government power plant which was described at some length in the Journal

of Electricity a year ago. There is no subject on which more misconceptions are held on the part of the public—and none more interesting when fully understood.

Among the agencies which contributed vitally toward winning the war was the motion picture.

The Motion Picture in Education

We are most of us familiar with its use as an advertising medium. The Food Administration, the Department of Agriculture, the Committee on Public Information, as well as the various Liberty Loan organizations brought their message to the public visually with great success—and this method of advertising an idea, or spreading a propaganda, if you will, has been firmly established as one of the resources at our command, side by side with the press and the printed word.

Not so well known is the part the motion picture played in the training camps. Here the problem was one of teaching a heterogeneous group with varying backgrounds of education how to handle complex machinery in a way to achieve the desired results and to avoid accidents.

In this emergency the process of the animated cartoon was offered to the government by one of its inventors, J. R. Bray—and developed into motion pictured mechanical drawing. Soon officers and men were able to witness moving pictures of the most complex mechanical operations, the idea of which could hitherto be conveyed only by verbal explanations.

The necessity for understanding the complex terminology was in large measure done away with. It was astonishing how easily men with no previous mechanical training were able to comprehend the operation of electrical forces, and such complicated series of operations as must be mastered in the use of depth bombs, steam shovels, or even machine guns. It was possible to stage demonstrations repeatedly without additional expense and to show the effects of accidents without danger. All could see what was being done—and in the darkness they could see nothing else. Attention was easy.

The method of instruction thus gained will not be abandoned with the end of the war. It is a permanent acquisition—and one destined in some measure to revolutionize our methods of instruction. It has long been felt that the motion picture was needed in the teaching of such subjects as geography or even history—but this new development opens up all the field of science as well. The mysterious subject of electricity, in particular, has much to gain from such a pictorial presentation. The operation of

the dynamo, the telephone receiver, induced currents—countless operations and processes at once suggest themselves as within the possible scope of such visual instruction.

There are indications that the present congress will appropriate a sum which will run into the hun-

One Department for National Engineering

dreds of millions for national roads. The plans of the reclamation and drainage projects which are part of the land settlement plans for returned soldiers contemplate one of the largest engineering programs the government has yet undertaken. Only forty per cent of the area of the United States has yet been accurately mapped and a movement is on foot to make the accurate survey of the remaining areas a part, and in some cases preliminary to the great engineering projects of the next fifty years.

Obviously it is time that a national Department of Public Works be formed which will supervise and unify this work. It is absurd to have a new bureau or commission created for every new engineering work undertaken and to have these parceled out among the cabinet from the Post Office Department to the Treasury.

The proposed plan of reorganizing the cabinet to make the new department possible, as recommended by the Chicago Conference of Engineering Societies, will probably be presented to this Congress—and when fully understood, should be supported solidly by every engineer. The plan does not involve any changes in the personnel of the present bureaus, nor contemplate an increase in the number of cabinet officials. Engineering activities, at present under five separate departments, are merely to be gathered together under one, the present Department of the Interior, that department thenceforward to be known as the Department of Public Works. There is no reflection intended on accomplishments of the past—merely the adoption of a more efficient working plan to better face the future. Engineers are too prone to neglect matters of legislation, both state and national, until after their adoption. This is a movement, however, for which the engineer must provide the main motive force—it calls for active as well as passive approval.

Our reserve supply of the following numbers of the Journal of Electricity has been exhausted:

January 1	March 1
January 15	April 15
February 15	May 1

We will allow credit of twenty-five cents on your subscription renewal for each copy of these numbers returned in good condition to the office of the Journal of Electricity.

NEW JOURNAL SERVICE: A series of articles on Better Merchandising Practice is inaugurated on page 571 of this issue. This is to include both wholesale and retail selling problems as they have actually been solved by merchants throughout the West. A special vacation issue is planned for July 15th which will feature a remarkable installation of electricity in the out-of-door conference grounds at Asilomar, California, together with vacation plans for the contractor-dealer and a summer use for the roof of a public utility building.

Attention is called to the request recently sent out by the Journal of Electricity to all subscribers asking for the name of firm and position occupied. This data is necessary in order that subscription lists may be classified to show the number engaged in the various branches of the industry. Personal items or trade notes for use in the columns of the Journal of Electricity are welcomed at the same time. Will you write in to let us know who you are at your earliest convenience?

Heating of Buildings by Electricity

BY V. H. GREISSER

(The region around Seattle with its abundant water power presents ideal conditions for the trying out of the possibilities in the electric heating of homes and office buildings. Actual experiments along these lines have been made by the Washington Water Power Company and the city of Seattle, with results as shown in the two reports here given. The following data is from the testimony of the consulting engineer for the Washington Water Power Company before the Idaho Commission Hearing and indicates that the field for electric open air heating is extremely limited.—The Editor.)

Statements are frequently made by the public that electrical heating of buildings in general will soon become an ordinary thing, and these casual observers usually qualify such statements with one or two reasons why this thing has not yet been accomplished—either that the power companies refuse to serve such business for unknown or arbitrary reasons, or that a satisfactory heater having high enough efficiency for practical use has not yet been produced.

The fact that a certain amount of buildings have been so heated, under special conditions or for particular reasons, increases the confusion in the mind of the average person as to why it has not become of universal application.

Wonders have been done with electricity, and in most of its applications during the last few decades it has enabled things to be done with greater facility and lower cost than by any other means.

The lower cost of electric power and light, in competition with the ordinary sources of power available, is considered direct evidence that the cost of heating by electricity will be equal or lower than with the usual kinds of fuel.

The Power Companies Open Minded

We believe that the three points covered above include all that can be said on this subject, and on the view that the power companies are arbitrarily refusing to serve electricity for heating, it should be noted that the whole effort of the power utilities is to sell electric power. It is the only merchandise

that they have for sale, and ordinary business sense would surely call for them to take advantage of all possible markets for their power.

The great magnitude of this possible load should plainly cause the power company to secure it if there were any practical way to serve it.

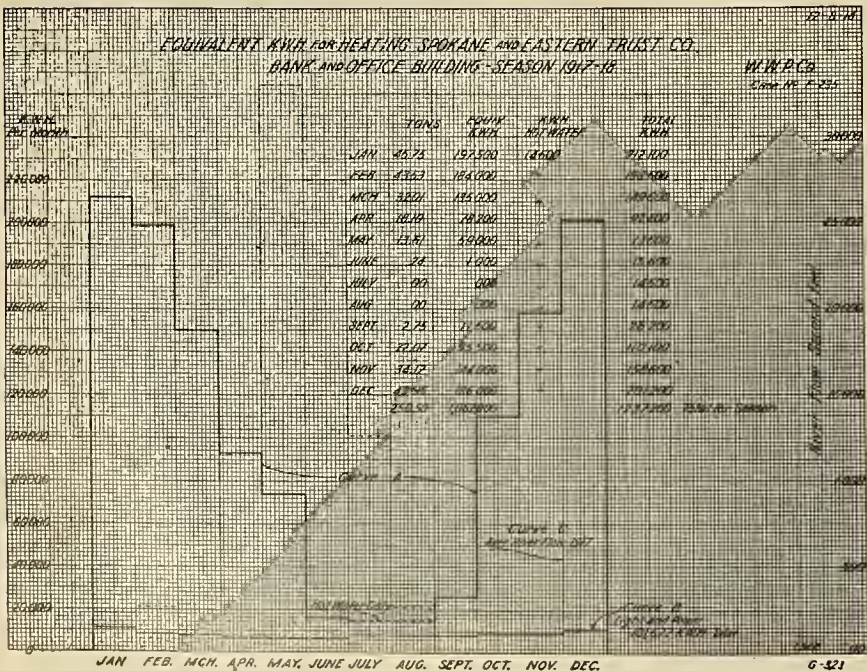
Referring to the second point regarding the possibility of electric heaters being developed which will have higher heating efficiency than those now in use, it cannot be stated too emphatically that no such improvement in efficiency is to be expected, either now or in the future. The heaters in use already have 100% efficiency in converting electricity into heat, and the only thing to expect is improvement in materials used, longer life, and perhaps less cost of manufacture of the heater itself.

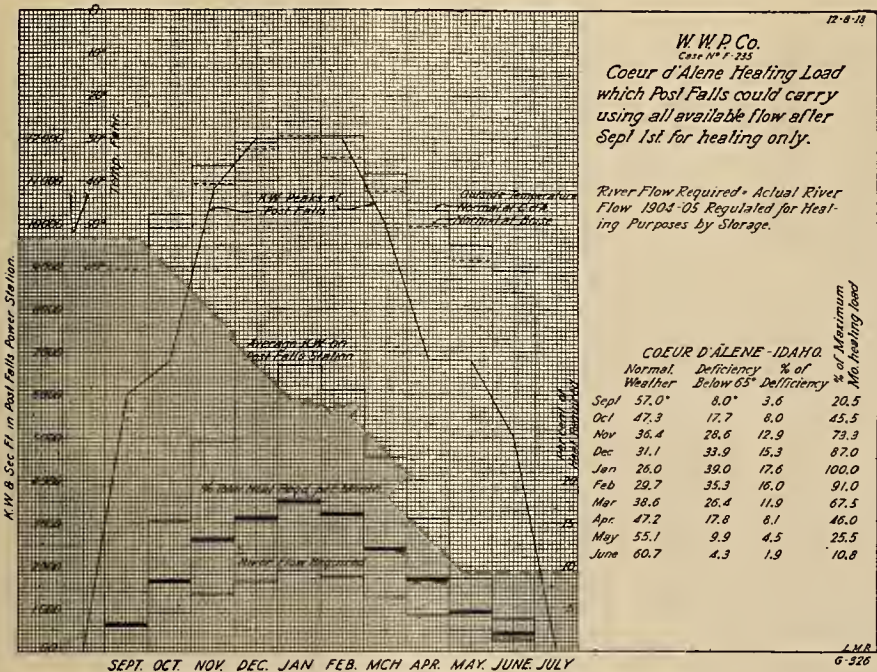
The third point, relative cost of electric heating vs. other types, is the only one which affects the individual case, and this discussion will be confined principally to the question of these costs.

Electricity Cannot Compete with Coal

Calculations and painstaking investigations, based on conditions as near as could be correctly estimated, fully indicated that electricity could not be delivered at a customer's residence or building at a price in competition with coal.

But the magnitude of the possible load in sight led the company to install a number of experimental heating installations to try and work out some practical way of securing at least a part of this business.





Knowing the total water storage which can be relied upon, it is possible to determine just how far the obtainable water power would go in heating the city of Coeur d'Alene for the winter. The actual river flow, river flow required, and kilowatt-hour demand are here charted. It is obvious from the conclusions that power is sufficient for only a part of the town requirements, no residence heating being included even in this amount. The power plant would have a heavy winter load, with nothing in the summer. No power would be left over from this plant to operate the Coeur d'Alene mines, railroads, general lighting and power.

This, it was believed, would show clearly what could be done, and eliminate those variable factors which affect heating requirements and which must be assumed in the engineering calculations.

The practical operating results thus obtained on various types of buildings could then be compared for the individual cases and some practical and reliable rules established for estimating heating for general use in Spokane.

In addition to the detailed information on these installations of electric heating as contained in the data sheets attached hereto, we also were able to secure full required information with costs on actual heating by steam and hot water, on some 20 office, theatre, bank and hotel buildings in Spokane, from which we are able to check information otherwise secured. This information has been compiled and included in the attached data sheets.

It should be clearly understood that this data on actual performance of steam and hot water gives reliable and valuable information which can be directly converted into terms giving the amount of equivalent electricity.

As stated before, if the amount of heat required for proper temperature of rooms is known, then there are certain definite processes for finding how much electricity is needed for the same purpose, therefore the data regarding steam and hot water heating has been included as correlated information, though this discussion is on the subject of electric heating.

Results of Experimental Installations

A number of electrical heating plants were installed. From the operations of these installations we have the following information.

Table showing the equivalent value of a kilowatt year and kilowatt hour to equal the cost of fuel to do the same heating, based on the most economical year of the record, corrected to normal seasonal weather conditions to make the results comparable:

Building	Former annual cost of fuel	Kilo-watts used	Kw-hrs.	Mills per kw-hr.	Dols. per h.p. yr.
Mr. Uhden's residence	\$ 90.60	28	69000	1.31	\$2.42
Mr. Henderson's residence	60.00	23	23700	1.635	1.95
Mr. Huntington's residence	245.00	50	181300	1.35	3.65
Mr. Merrill's residence	65.00	20			2.42
W. W. P. office building	1399.00	280	1175000	1.19	3.73

The above table shows the startling result that in order to heat the respective buildings as cheaply with electricity as with fuel, it would be necessary to deliver electric power to the customer's premises at from \$1.95 to \$3.73 per horsepower year. This price is absurd, especially when in connection with that price it is to be remembered that such load would absorb the power possibilities of the northwest and leave little for industries and ordinary uses.

Not Enough Available Power

The heating load alone would have an annual load factor of about 28%. Loads which would fill up the valley of load curve are practically impossible to obtain. For some particular localities and conditions, irrigation will in part take up this slack or want of uniformity of power demand for heating.

This leads us again to the general proposition of electric heating. Assuming that power could be delivered at a price competitive with fuel for heating, how much power would be required for heating any locality? Knowing this amount, where can we secure it?

In answer to the first question, and considering Spokane because we have more definite and reliable information on it, we can repeat the former statement that it will require between 400,000 and 500,000 kilowatts to carry the peak of this load.

The commission has determined the average continuous power of the Washington Water Power Company's plants on the Spokane River at 93,675 horsepower or 70,000 kw. With the development of all other practical sites on the river, this value will be approximately doubled, or 140,000 kw. continuous.

The heating load having an annual load factor of 28%, then

$\frac{140,000 \text{ kw.}}{.28} = 500,000 \text{ kw. peak for December, January and February.}$

In other words, all the power developments of the Spokane River, from Lake Coeur d'Alene to where it empties into the Columbia River, would hardly take care of heating Spokane alone, not counting the electricity required for power and light purposes or for operating street cars, railroads, mining, and so forth.

Assume that the average price of coal delivered in Spokane was \$9.00 per ton, on present basis, then 200,000 tons of coal would cost the people \$1,800,000 for fuel bill.

An Idaho Example

As a final example of this question, and referring again to the magnitude of the market for general heating by electricity, a study has been made of the use of the Post Falls power plant for heating the city of Coeur d'Alene, Idaho. From the careful consideration of this matter, its continuous capacity, while utilizing all benefits of storage existing in Lake Coeur d'Alene, has been fixed at 5930 horsepower (or 4423 kilowatts).

Due to the fact that the city of Coeur d'Alene is nearby, and that the lake offers a medium for storage of water permitting its use as required by the heating load, this makes an ideal plant to consider for such purposes.

Due to information derived from this investigation, we are able to closely determine the amount of heat required in percentage of total for each month during the heating season. Knowing from past experience and governmental records, how much total water can be relied upon for such period, it

was possible to allocate to each month the amount of river flow in proportion to heating demands.

Having adapted the river flow to those conditions, then by ordinary engineering calculations, the respective kilowatt hours and kilowatt demands were also derived.

Transmitting this power to the city of Coeur d'Alene from the existing power plant at 60,000 volts, and installing a suitable stepdown substation and distribution system in that city, it was found that this plant could only furnish heating to the principal business houses. The total kilowatt hours to be sold would approximate 20,000,000 per heating season, and reach a peak of some 10,000 kw. for heating plus light, and in transmitting, transformation and distributing, the power plant would have a peak of some 12,000 kw. during the coldest months and a kilowatt hour output of 27,000,000 kw-hrs.

A number of things are to be noted from this example.

Power is sufficient for only a part of the town requirements.

No residence heating included in the example given.

Power plant is using all available water for eight months and running at maximum capacity in December, January and February, and practically no load in the summer. No power would be left from this plant for operating the Coeur d'Alene mines, railroads, general lighting and power.

If this were a feasible plan, there would not be any power available from Washington because the capacity which could be secured there would be absorbed in heating buildings in Washington.

Experience With Electric Heating in the Northwest

BY J. D. ROSS

(A more favorable conclusion for electric house heating is reached by the Superintendent of Lighting of the City of Seattle as the result of experiments carried on under his observation. Whereas electricity may never be used generally to heat houses or in an exactly equivalent fashion to steam, it is capable of great flexibility and may be used to heat part of the house, or as auxiliary heat as an off peak load where cheap water power is available. The data formed part of the testimony before the Idaho Public Utilities Commission.—The Editor.)

Seattle is surrounded by water powers which permit the economical generation of electrical energy. With a view to studying the possibility of the heating of dwellings by such low-price energy, the writer, about four years ago, began a series of experiments on electric heating of houses.

In order to make electric heating an off-peak load, some heat storage is necessary. Electric heaters adapt themselves to hot water, steam, hot air, or direct heating, or to any combination of these methods. In order to test these possibilities of electric heat, experiments were made with almost every type.

Electric Heating as an Auxiliary to Coal

The first of these installations was in a cottage at 1119 Grand avenue, Seattle, and included equipment totaling 6100 watts. Later, at 802 Thirty-third avenue, an electric water heater was installed to work in conjunction with the boiler of the hot-

water heating system. In the coldest weather both electric and coal heaters were used while in mild weather the electric coil alone was used. This scheme of using electric heat with coal as an auxiliary has some advantage over the use of either alone. The electric heaters need be only half the capacity they would be to do the heating alone in the coldest weather. Since the load connected determines the rate for current, there is a considerable saving in the cost of electricity. At the same time little coal is required because the electric heaters alone are sufficient except in the coldest weather.

Another method, using electricity for auxiliary heating, was tried at 530 Thirtieth Avenue South. This house had a hot water heating system. The radiators in the rooms most used were equipped with individual electric heaters placed in the basement directly under them. Each heater was connected so as to permit the water in its radiator to circulate

through it, and at the same time the circulation from the coal-fired boiler was not interfered with. This method permits the automatic regulation of the temperature in each room by a thermostat working on its individual radiator. Only enough coal was used to keep the entire house at about 60 degrees Fahr., and each electric heater was used to bring its room to the temperature desired.

The first heaters used here were simply coils wound around a section of the pipe, using the pipe for a short-circuited secondary and getting the heating effect from the hysteresis and eddy currents in the iron pipe. These heaters were inferior to the resistance type used later, since their power factor was low and it was next to impossible to eliminate the humming sound. This noise seems to be inseparable from the induction type heater. Although a type has been developed that is so well constructed that the heater itself is noiseless, even this is apt to produce a noticeable hum when connected to a piping system.

Experiments using electricity as an auxiliary to ordinary furnace heat prove that electric heat is most convenient, but give little information on the economy of using electric heat alone. Data on this point has been gathered from four houses using electricity exclusively for heating. The first of these, the frame house on Thirty-seventh avenue, was fully equipped with heaters, heat storage tanks, automatic heat control, recording wattmeters and all the apparatus that was needed for a complete test. There are nine rooms, four on the first floor and five above. The downstairs rooms were kept above 70 degrees Fahr. during the day and allowed to run down to 60 degrees during the night. The upstairs part was maintained at about 65 degrees during the day. Heat control was entirely automatic; thermostats were used to keep the temperature within 2 degrees Fahr. of the desired mark, and current was turned on in the morning by a time-switch so that the house would be warm before time to arise. The installation was made in February, 1914, and the house has been maintained at a comfortable temperature at all hours since with practically no attention. Characteristics of the house are as follows:

EXPPOSED WALL SURFACE	
First Floor:	
Exposed wall area.....	2,429 sq. ft.
Window area.....	180 sq. ft.
Cubic contents.....	10,475 cu. ft.
Second Floor:	
Exposed wall area.....	2,367 sq. ft.
Window area.....	197 sq. ft.
Cubic contents.....	12,275 cu. ft.

Floor surface is included in the wall area of the first floor to care for the unheated basement. Three-fourths of the ceiling is included in the wall area of the second floor. The house is of first-class construction. The hot-water heating system is of liberal design with a total of 690 sq. ft. of radiation. Four 10.5 kw. bayonet-type heaters were used, arranged with a storage tank of 500 gal. so that the water could circulate from the radiators through the heaters or through the storage tank. A time-switch was used to disconnect the circuit entirely during the hour of lighting peak, amounting to four and one-half hours in the winter months. Readings were

taken daily for four months beginning with September, 1914, of the average, maximum and minimum air temperatures inside, upstairs and downstairs.

TABLE I
Average Temperatures and Monthly Energy Consumption, Electrically Heated Thirty-Seventh Avenue Dwelling

	Avg. Temperatures			Min. Avg. Difference			Kw.-Hrs. To Storage tank	Total
	Out-side	Up-stairs	Down-stairs	Out-side	Up-stairs	Down-stairs		
April, 1914.....	47	66	70	34	19	23	.....	1,928
May.....	53	67	70	39	14	17	.....	968
June.....	54	67	70	39	13	16	.....	634
July.....	60	.....	.....	45	.....	.....	.....	79
August.....	59	.....	.....	44	.....	.....	.....	260
September.....	53	67	71	42	14	18	677	3,015
October.....	51	66	70	39	15	19	.....	2,950
November.....	42	66	70	29	24	28	.....	6,357
December.....	36	66	70	20	30	34	4001	9,651
January, 1915.....	37	66	70	24	29	33	.....	8,068
February.....	40	66	70	25	26	30	.....	5,728
March.....	45	66	70	30	21	25	.....	4,290
April.....	49	67	70	33	18	21	.....	3,018
May.....	51	67	71	40	16	20	.....	2,954
June.....	55	.....	72	42	.....	17	.....	1,976
July.....	60	.....	.....	48	.....	.....	.....	284
August.....	63	.....	.....	50	.....	.....	.....	103
September.....	64	67	70	41	13	16	.....	1,517
October.....	50	66	71	40	16	21	.....	4,244
November.....	40	66	72	28	26	32	.....	8,223
December.....	37	65	72	20	28	35	.....	9,075
January, 1916.....	27	64	70	10	37	43	.....	14,046
February.....	38	65	72	22	27	34	.....	10,990
March.....	40	66	72	28	26	32	.....	8,600
April.....	45	66	72	34	21	27	.....	6,480

Readings were also taken of the temperature of the circulating water, both outgoing and returning, to show the action of the storage tank. This tank has proved able to care for the hours when the current is cut off. The temperature at the end of the four and one-half hour peaks in December never dropped below 70 degrees. On the coldest days the water in the tank dropped from 190 to 104 degrees during the peak, and the usual range of temperature during cold weather was from 170 to 180 degrees in the tank at the time the current was turned off to 110 degrees to 120 degrees at the time it was turned on again. Readings on temperatures have not been made regularly since the four months' test, but occasional checks show that the temperatures maintained inside the house are practically the same as during the test. Table I shows the average temperatures and energy consumption by months.

Three other houses were equipped with the same system of electric hot-water heat, and data collected for periods covering approximately two years. Synopses showing the current used per year are given in Table II. Although the characteristics of the houses are omitted, the number of square feet of radiation, which was figured on the same basis as that in the Thirty-seventh avenue house, is given in each case, and serves as a measure of the estimated heat requirements.

TABLE II
Electric Heating Results from Four Seattle Houses, Water Circulation System

	ADDRESS			
	225 37th N.	1605 36th	615 Terry	802 33rd
Number of rooms.....	9	9	.....	7
Kw. of heaters.....	42	32	12	10
Square feet radiation.....	690	640	328	350
Consumption, kw-hrs., 1st year.....	42850	39320	57210	54930
Consumption, kw-hrs., 2nd year.....	63860	41880	*18100	*23990
Average consumption, kw-hrs.....	53355	40600	.....	.....
Consumption per square foot of radiation per year.....	77.3	63.4	.....	.....

*Used as auxiliary only, during second year.

Results with Electrically Heated, Oil-Filled Radiators

During 1915 a number of heating installations were made with oil-filled, electric-heated radiators.

These consist of an ordinary hot water radiator filled with oil and having a cartridge type heater inserted in the top. This scheme of heating has the advantage that each room has its own heater, and no piping is necessary. Results obtained with the oil radiators are practically the same in energy consumed and temperatures maintained as with the hot water system, with the exception that there is very little storage of heat in the oil radiators to tide over the time when current is turned off. Data on two houses using the oil-filled system are given in Table III.

Electric Heating Results—Two Dwellings Using Oil-Filled Radiators	2541	1238
	11th Ave. W.	E. Fir
Number of rooms.....	5	8
Kilowatt of heaters	10½	31½
Square feet of radiation	160	640
Duration of test (months)	7	7
Consumption, kw-hrs.	9777	50960
Estimate for one year, kw-hrs.	16000	85000
Kw-hrs. per square foot radiation.....	100	130

Sufficient data has now been collected to enable us to make a definite statement as to what can be done in any given case. However, so many variable factors enter into the heating of a home that each house must be studied and estimated by itself. The problems presented are almost entirely the same that have been met with regularly in heating and ventilating, except that here we have kilowatt hours to deal with instead of the more familiar "B.t.u.'s." With electric heat the energy is, in general, several times as expensive as in the form of coal, so that every device for saving heat is valuable.

In the ordinary building with good ventilation the heat loss is about four-fifths through the walls, while one-fifth is used to heat the air. With improved heat insulation in buildings it is conceivable that half the heat now required may do the same work without in any way impairing ventilation, which requires about 30 cubic feet of air per minute for each person. Any improvement tending to reduce the amount of heat necessary gives a corresponding advantage to electric heat.

The hot water heating system with ample storage tank seems to present the most advantages for use with electric heaters. This is due to the fact that the heat storage keeps a uniform temperature, for less heat is required for comfort with steady than with intermittent heat. Considerable economy of heat is to be gained by covering the basement pipes, and especially the storage tank, with heat insulation at least 2 inches thick. The tank, fitted with a small centrifugal circulating pump, will keep the house at an even temperature during the lighting peak when the current is shut off.

Heating, however, cannot be permanently classed as an off-peak load. This is evident from the fact that about ten times the capacity of installation is necessary for heating a house than is used for lighting it. When one house in ten is electrically heated, then the load-curve valleys will be filled up. After that the success of heating by electricity will demand cheap electricity at all times, which is only to be had from water power generated in large units and distributed at comparatively high voltages. It is feasible to serve heating customers at 500 or 600

volts three-wire system, which would materially reduce distribution cost. This would give a voltage for the heating service of 250 or 300 volts.

Comparative Cost of Electric Heating

The comparative cost of this method of heating is fairly well established. With electricity at one-half cent per kilowatt hour, it is from 25 to 50 per cent more expensive than for coal at \$6.00 per ton. At one cent per kilowatt hour, the electricity is two and one-half or three times as costly. These figures are borne out by theory, which indicates that the 10,000 B.t.u. in a pound of coal cost 0.3 cent, while in the form of electrical energy, the 3413 B.t.u. in 1 kw-hr. will cost one-half cent, making the current roughly five times as expensive. Then allowing for a furnace efficiency of 40 per cent, which is fair for the ordinary furnace, the current should prove twice as expensive. The showing of less than one and one-half times made in the experiments is probably due to more care in the use of heat, so that less was wasted.

Heat the House Room by Room as Needed

A great deal can, however, be done in a home where care and economy are practiced. On account of the difficulty of controlling a coal fire and the fact that a house is heated from one source, as in the case of a furnace, it is the general custom to heat every room whether it is necessary or not; it naturally follows that every room for a great part of the time is at the maximum temperature—about 72 degrees. If the same system were followed out in the electric lighting of the house, the bills would be almost prohibitive. If the public can be educated to the point of heating the rooms to be occupied by means of a flexible system of electric heating—preferably one that brought the entire house to a temperature that keeps the rooms dry and not uncomfortable for anyone passing through—while auxiliary heaters, separately regulating each room as desired, giving preference to those continually occupied—the cost would be very materially reduced below the above figures.

The Immediate Opportunity for an Off-Peak Load

From the standpoint of the central station, the off-peak load can be largely filled if 10 per cent of the homes on its lines used electric heating. There are probably that proportion of customers who are willing to pay the extra cost on account of the greater convenience, sanitation and cleanliness of electricity.

Electric heating from steam power plants in the present state of the art is out of the question, excepting at a very great cost. In the case of water power where the flow is made even by storage, the conditions somewhat approximate those for steam, in that each gallon of water may be used when desired and so represents a value. On the other hand, in the case of a water power using the minimum flow of a river, it would appear that electric heating would have its greatest application, this being particularly true where the maximum flow of the river comes during the late fall, winter and early spring, and is a minimum during the summer at the time when heating is least needed.



View of the Rolling Mill. The building is constructed of brick, glass and steel and is 450 feet by 125 feet.

Electricity in the Making of Copper Wire

(The operations and equipment of a modern rod and wire mill are here described in detail. This new mill of the Anaconda Copper Mining Company, situated at Great Falls, Montana, has only recently begun work, but has already reached a high state of efficiency.—The Editor.)

The new rod and wire mill recently completed at the B. & M. reduction works in Great Falls has a capacity of 100,000 pounds of rods and 50,000 pounds of wire every eight-hour shift; in other words, it is able to consume as raw material one-tenth of the copper output of the Anaconda Copper Mining Company in producing rods and wire for commercial use.

While there are certain features of the new plant which have yet to be installed, because of delay in getting the machinery required, the operation of the new units now in use has already demonstrated a high efficiency and the finished product has commanded favorable attention and a market far beyond the national boundary.

The Building

This new mill is not far from the "Big Stack" which has long been known as the trademark of the city of Great Falls. The building housing the plant is 450 by 125 feet, one story in height and is constructed of brick and steel on a concrete foundation. A spread of glass of immense proportions gives an ideal light for the work. The cost of the plant, when all the features of machinery have been put in place, will exceed \$800,000. It has been built by the engineering department of the Anaconda company under the direction of W. N. Tanner, mechanical engineer, and George Tryon, mechanical superintendent, the plans being from the offices of W. A. Wood, consulting engineer, of New York.

The site for the rod and wire mill was selected on Thursday, June 28, 1917, by Frederick Laist, manager of the Anaconda Copper Mining Company, and on Monday, July 2, ground was broken for the foundation. Work was carried forward steadily until the building was completed and the machinery placed. The first rods were rolled on June 26, 1918, and the first wires drawn about July 15th.

Description of the Plant

Because of the fact that this plant brings not only to Great Falls but to Montana an entirely new feature in its industrial life, something of a detailed description of the plant from the viewpoint of a layman will be of interest. The company observes the

friendly policy of making welcome visitors to the city and residents of Great Falls who are interested in seeing the rolling mill in operation and the machines drawing wire.

The rod and wire mill structure faces the south, the rod division being at the east end, the wire drawing machines at the center, and the stranding machines and the warehouse at the west. In starting a trip through the mill, the logical course is to go from the northeast corner where the copper bars are brought from the refineries to be fed into the furnaces for heating and then passed to the rolls from which they are to come in the desired size of rod, that being determined by the number of rolls through which the metal is passed.

The Bar-Heating Furnace

Bars are passed into the Rockwell bar-heating furnace, which is located at the northeast portion of the building and has a capacity of 100 bars of the 225-pound type. This furnace is heated by oil, the degree of heat attained ranging from 1,200 to 1,600 degrees Fahrenheit. The bars are taken from the furnace at the end opposite to the point of entrance and are handled to the heavy rolls but a few feet distant from where the bar is taken from the furnace. This is termed the roughing mill and reduces the bar to a size suited to handling in the finishing rolls, there being two sets of rolls, one the intermediate and the other the finishing. When the heated bar is started through the rolls it can be reduced from the size of four inches square to a rod a quarter of an inch in diameter in slightly less than one minute. The mill is handling them through easily in one minute now.

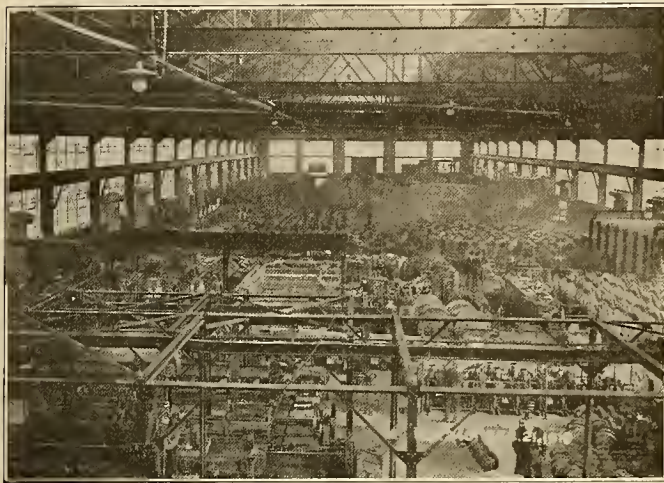
As the rods pass through the rolls, constantly reducing in size, the length, of course, increases rapidly and in order to take care of that, the floor in front of the finishing rolls has been cut on an incline so that the length can be more easily handled. The concrete floors where the hot rod passes are all kept oiled, and the rods move smoothly over them, much as snakes might do. The sight is an extremely interesting one when the rolling mill is being operated at night.

Cooling and Cleaning the Rods

When the rods come from the rolls in their desired size they are of a dull black color and the next step in the process is to give them a bath for their cleaning process. After being wound upon a spool they are carried to a tank where they are dipped into a sulphuric acid solution, remaining in the bath for about one hour. They are then removed and after drying are ready to go to the wire machine. As they come from the bath they are a bright copper color.

The Wire Machines

When the rods have been cooled and cleaned after the rolling process they are sent, according to



Interior of Rolling Mill, looking east. The plant is operated by electricity and furnaces heated by oil.

the size desired, to the wire machine on which they are to be drawn. There is a special machine for drawing trolley wires and the plant is now equipped to draw a wire sixty-four one thousandths of an inch in diameter and four miles in length.

The first wire machine is a powerful one for drawing the larger wire, ranging in size from No. 6 up. Wires are produced by the method of elongation, the rods being drawn through dies made from hard chilled steel with a tapering hole of an exact size. The dies are made to exact measurements of one-thousandth of an inch. The size of the wire is determined by the drawing, and the smaller the wire the more work required in the process. One of the 225-pound bars will make a wire one mile long when drawn into No. 9, or the common type of telephone wire—that is, about one-ninth of an inch in diameter. But the mill can make a wire as long as may be desired. This is accomplished by brazing the ends with silver solder and borax. When the wire has been brazed, only some one who is familiar with that sort of work can discover the point where the work was done.

As the wire passes from the machine it is again spooled, and if it is to be used in the stranding of cables, the spools are of a special size designed to fit the stranding machine. If the wire is for the trade in the form in which it comes from the machine, it is put on a different spool.

Stranding Machines

The stranding machines are so constructed that the spools holding the wire pass on a revolving frame

as the wire is fed into the cable, and the cable is drawn and rolled on to a spool at the end of the machine. The spools holding the cables are of the type usually seen in telephone or power line construction work. They are built with a large drum around which the cable is rolled, heavy wooden ends protecting it and at the same time holding it in place. Necessarily, the spools depend, as to size, on the size and length of the cable to be handled. The strands which are being made for the Milwaukee road are being reeled on to spools that will hold one mile of cable.

Persons buying wire have observed that sometimes they get an extremely hard wire while at other times they get a softer wire. That is the result of treatment in the annealing furnace where the wire is heated after having been cooled, and from which it is turned at the desired state of hardness. The furnace is at the southwest corner of the big plant



Interior view, looking west. The capacity of the plant is about 100,000 pounds of rods and 50,000 pounds of wire.

and this treatment is given the wire after it has been reduced to the desired size in the drawing.

One of the interesting facts about the wires used for power companies, viewed from the layman's standpoint, is that the low tension current is carried by the large strands while the high tension current requires the small strand cables. The company is making a large quantity of feeder cables for the Milwaukee railway for its electrical division on the coast and this cable will be of the 37 strand type. The order for this work calls for 6,000,000 pounds of the cable.

In the stranding of the cables there are three machines used, one stranding 7, one 19, and the other 37 wires. The last one is called the three head tandem, and the cable may be passed through this and wires added until the final cable contains 91 strands.

Electrical Equipment

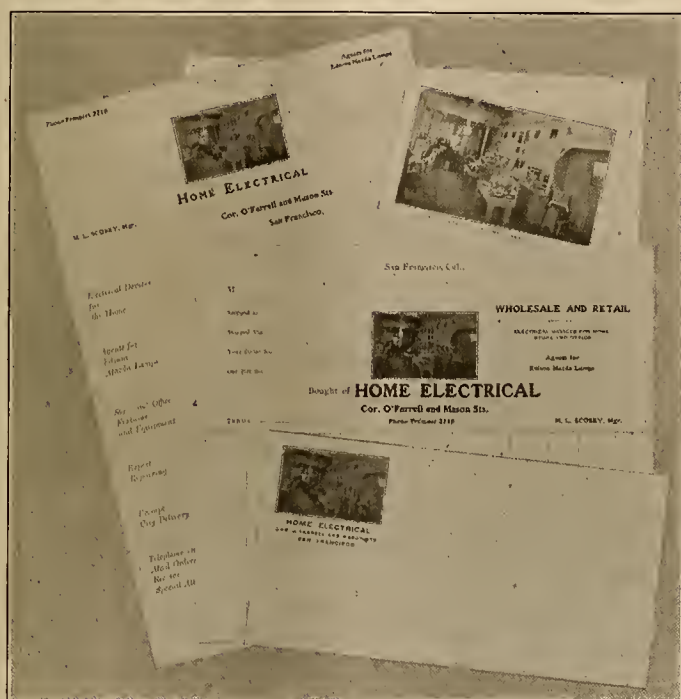
All the machinery of the new plant is electrically operated and the various machines are handled by separate motors. The rolling mill requires three motors of 500 horsepower each, while the stranding machines require about 600 horsepower for the three machines.

The Semi-Downtown Electrical Store

(Here is the problem of a store which is half-way between the shopping and the residence district, and which has made capital of this particular position for its own advantage. Here also is an experience with the California Electrical Cooperative Campaign solicitors which may suggest possibilities for widening your own field of action.—The Editor)

The problem of the dealer whose shop is located half-way between the residence district and the main streets of the shopping district is distinct in itself. It is neither that of the home specialist who studies the needs of his particular district, nor of the strictly down town establishment which catches the passing trade of shoppers the city over, in some measure parallel to the trade of the department store.

As an example of a store which is so located in this border district and which has built up a trade of its own appropriate to the situation, may be noted



Letter paper, billheads, cards and envelopes carry the reminder of the distinctive store interior. Note the emphasis laid upon mazda lamps—the backbone of the electrical dealer's business—as well as the suggestions of future service to be found down the side of the paper used for correspondence.

the "Home Electrical," corner of Mason and O'Farrell streets, San Francisco, of which M. L. Scobey is proprietor. Although this shop may be said to be down town in its location, nevertheless it is out of the way of the regular shopping trade and cannot hope to draw the trade of the vast shopping public purely on the basis of position and window displays. On the other hand, rents are not so prohibitive as farther down town—and the district has possibilities of its own.

The Apartment House Trade —

Back of Mason street for seven blocks, as far as Van Ness avenue, lies the great apartment house district of the city and on the other side, immediately adjacent, the business district. If window displays of electric washing machines and mangles fail to call in orders from the passers-by, a nice selection of flat irons or grills, table lamps or hair curlers will attract

the eye of the apartment dweller and help make even a compact three rooms homelike. On the other hand, there are lamp contracts to be made with business houses, an opening wedge to further demands for department store and office building necessities along other lines.

For all this, the store itself offers the best advertisement. It is located on a corner—many people pass by it from other districts as well as the many apartment house dwellers, and once they have passed by, they recall the establishment as attractive and businesslike and up-to-date, and a good place to go when in want of substantial electrical ware.

All Window —

The distinctive element of the store is perhaps the fact that it is virtually all window. With its shallow frontage on Mason and a long stretch of window along O'Farrell, with no screen to break the view, everything in the shop is apparent to the passer-by. To add to this effect, the store is attractively finished in a light wood with a eucalyptus stain and is entirely devoted to a show room and counter. All storage is relegated to the basement store room. Even the office is removed from this floor and occupies a mezzanine floor made attractive by being finished as a home exterior with fresh curtained windows and window boxes. The store is lighted by decorative semi-indirect fixtures, not the open lamps and reflectors so often seen in small retail establishments.

In the evening these are lighted, giving the whole store the appearance of an attractive interior, by far the best illuminated and most attractive window in the neighborhood. There is a strip of carpet the length of the store with a rug in the rear, convenient for vacuum cleaner demonstrations, on which is a library table and portable lamp.

Store Arrangement —

Appropriate to the idea that the entire store is a show window, there is nothing to be seen except such goods as may attract the attention of the customer and perhaps suggest further wants. Such necessities as small batteries or lamps, for which there is no need to stimulate the demand, are kept in cupboards in the wall, conveniently arranged so that the doors swing up entirely out of the way when something is wanted; or neatly paneled in wood, appear simply as part of the wall on ordinary occasions. Electric irons, on the other hand, for which the apartment householder has frequent demand, occupy a conspicuous table near the door. Electric grills of all sizes and makes are conveniently at hand on the sideboard-like shelf behind the counter.

The counter is divided into two portions and consists of glass cases of the sanitary type, raised above the floor, with glass shelves, so that considerable storage room is presented, with perfect open-



The store is attractive without suggesting a great outlay of money which must be reckoned in the overhead and subsequently reflected in prices. Everything visible is chosen for display, articles of less advertising value being stored in the cupboards behind the counter. The entire store is a show window.

ness. Here are such things as hair curlers, warming pads and electric vibrators. The little ornamental paper shades of which a pile of all colors occupies one corner of the case, are an example of an article usually unknown to the customer and likely to be purchased purely as the result of the suggestion of seeing it so conveniently at hand. A lady with an iron to be mended purchased several pink ones to match her bed room; the proprietor of a restaurant who was ordering lamps took a whole set of red, white and blue shades to form part of a patriotic celebration.

Across the top of the cupboards behind the counter are a series of compartments with dark background and glass doors in which attractive nickel-plated appliances are displayed. These are seldom disturbed, being used as samples from which the customer may ask for other stock, and consequently are placed above ordinary reach, but not too high to be attractively visible from the floor. Above this, against the buff tinted wall, are framed photographs of appliances in use which add to the beauty as well as the practical business suggestiveness of the whole display. The windows are provided with a background in the form of a neutral tinted curtain, some eighteen inches in height, and are very narrow, providing only the foreground of the picture, of which the main store furnishes the whole.

Attractive but Not Costly —

The entire establishment is kept scrupulously neat—but with all its careful arrangement and attractive finish, it maintains an air of simplicity and usefulness, not calculated to frighten the purchaser as to the price which it would be necessary to pay for a too elaborate background. The finish is everywhere of the mission order, materials used are simple and effective, rather than rich or costly. The customer is given the impression that while the establishment is wide awake, there will be no fancy prices added for excessive overhead. In other words, the matter of beautiful interiors may be overdone—flat irons and toasters do not appeal to the customers in the same mood as expensive furs or jewelry—but the proprietor of the Home Electrical has nicely provided for this psychological difference and has not in any measure overdone his work.

Selling Lamps —

Lamps are the mainstay of any dealer, but more

particularly of the dealer in the down town district. Business houses deal in lamps in large quantities and an effort has been made by the proprietor of the Home Electrical to gain this trade. In consequence lamp contracts with office buildings, libraries and department houses have led to further orders for portable lamps, lamp guards, automobile electrical necessities for delivery trucks, and the many other details of purely business needs. Various sizes of mazda lamps are displayed, well toward the center of the store, so that customers inquiring for this article must come in where other appliances may suggest themselves. The varying intensities of lamps may be demonstrated at this rack—and for further convenience a slip socket is provided, so that all lamps sold may be tested for the customer's satisfaction before being wrapped. This saves complaint where accident to the lamps on the way home might have been blamed on the store. So important is this feature of lamps, that it is advertised conspicuously on letter paper and billheads as a constant reminder to customers.

Convenience sockets are provided at inconspicuous places throughout the store, although electric articles are becoming sufficiently well known so that there is little call for demonstrations. Vibrators, occasionally electric heaters, vacuum cleaners and washing machines are among the most commonly demonstrated. When an article is sold with a guarantee, particular care is taken to keep a record of this with name, date and description of the article. These are kept on file for several years and avert trouble in many a case where the customer is sure the article is only six months old, but in reality it proves to be a year and six months.

Making the Repair Department an Asset —

In line with this same care for records is the practice adopted in the repair department. Here it was found that occasionally slips would be made and a customer who had brought in a cord to be mended would insist that there was an iron attached to the cord when left. In order to avoid such misunderstandings, a more complete tag for repaired articles was provided which, besides name, address and date, leaves three or four lines for description of the article, which is enumerated in detail in order that there can be no question of fact at a later date. This has a detachable stub which becomes the customer's

property and means of identification. It is interesting to note that in connection with the business trade which has been built up, there is considerable repair work, the electrical departments of department stores and even hardware dealers often bringing appliances in to be fixed or explained. This is gladly done and furnishes a basis of good feeling which leads to other orders.

Spreading Out to the Residence District —

The location of this store in the apartment house-business district, however, has not done away with such purely home business as washing machines and vacuum cleaners—this business is merely carried



Nº 1140

Date _____

Name _____

Address _____

Article _____

Send Will Call _____

REPAIR CHECK Nº 1140

FROM

HOME ELECTRICAL

O'FARRELL AND MASON STS.
Phone PROSPECT 2718 SAN FRANCISCO

In many establishments the repair department is a source of friction with customers, rather than an asset to the good will of the business. By keeping accurate and complete record of what is left for repair and all data connected with it, many difficulties are avoided. The rest is with the quality of service. The value of a satisfied customer cannot be overestimated.

on through solicitors. It was found that there was apt to be not more than one or two inquiries concerning washing machines in several months—but by means of house-to-house solicitors who are obtained through the cooperation of the California Electrical Cooperative Campaign, this business has not only been greatly increased, but customers from all over the city are made familiar with the store and come to it for other necessities.

This is one of the first instances in which the solicitors provided by the campaign have been used—and the results thus far are proving eminently satisfactory. The idea is that the campaign, by providing the men for those who make application, makes it possible for a dealer to secure the services of a worth while solicitor for whatever part of the year he feels that he can afford one. The solicitor is paid generously, 15% on sales—and is guaranteed a fixed sum per month. This is carried over from week to week, however, so that sales even up. If he does not earn enough in a month's time to meet his guarantee, his services are not worth enough to continue.

This has worked out very well. The Home Electrical now has two such solicitors in the field. These provide their own prospects and go at the problem each in his own way. One worker establishes headquarters at a neighborhood drug store or grocery store and leaves his vacuum cleaner or wash-

ing machine there on display. He next makes his house to house canvass and when a housewife is interested, takes his machine to her home later for a demonstration. In this way he secures a familiar headquarters and in some sense, therefore, an introduction and at the same time has the the advantage of the incidental advertisement of the article while on display.

Carrying the Store's Reputation —

In all cases, he comes as the representative of the Home Electrical and carries a card of which one side holds a picture of the store, the other its name and his as agent. The prospect's mind, whether she actually purchase the machine or not, is directed to this prosperous, up to date establishment and she immediately becomes a possible future customer for that store.

Time payments are found to particularly appeal to women who like to charge their washer against their laundry bill and save a large investment on the part of their husbands until some time when they have a personal request. This is found to hold true of vacuum cleaners and other articles as well—in fact, it would hardly prove possible for the solicitors to make the effective record which they do without this inducement.

Charting Progress —

A careful record is kept of these campaigns as well as of store sales. In this connection an interesting practice is followed. Most people who pay cash for their orders do not care for the sales slip—in fact often discard it before leaving the store. It is only where the purchase is made for a second party that it is retained. A recognition of this fact has led to a simplification of the sales record which saves paper and is further a great convenience. This is to enter all cash sales in succession on the same slip which is retained in the book until entirely filled, unless a request is made for a special slip. Duplicate and triplicate are kept as usual, but there are perhaps half a dozen slips to the day in place of the dozen or more. These are easily added at the end of the day and a record kept of day's sales, day's costs, profit and per cent of profit. At the end of the week this is figured more completely and a record made which is compared with the corresponding week of preceding years. Charge accounts are reckoned by the month and the total used as a means of checking up progress. It has been said that a man who knows where he is going is half-way on his way—and this holds true in particular of the Home Electrical.

This is the first of a series of articles on better merchandising methods, both wholesale and retail. If you are accomplishing worth while results in your establishment, let us know about them; we will be glad to include you in the series. An idea exchanged is an idea doubled.

Problems of the Retail Trade

BY M. A. DE LEW

(The Santa Cruz Convention planned by the California Association of Electrical Contractors & Dealers for June 26th to 28th is to be one of the most important gatherings of the year for the consideration of retail problems. The keynote of the gathering is struck in the able president's report, here given, which takes up the problems of the year past, and makes recommendations for the future.—The Editor)

PRESIDENT'S REPORT

Gentlemen of the California State Association of Electrical Contractors and Dealers: We are here assembled at the third quarterly meeting which, in point of numbers, will be the most important meeting during my term as State Chairman. I shall endeavor to enumerate some of the matters that will be presented for your consideration.

Financial

You will hear read the financial report of the Secretary-Treasurer, which will indicate the complete depletion of the treasury. That means shall be provided to replenish same, is a matter that is hardly necessary to direct to your attention. A revolving fund of about one thousand dollars is necessary if embarrassment is to be avoided. This financial condition is largely brought about by a general misunderstanding regarding the new arrangement of dues and the National Association affiliation.

State Association

The Association, generally speaking, is in a much better condition than ever, owing largely to the fact that the members are rapidly arriving at the point of having faith in each others' integrity. The Association has by no means grown in point of numbers, but has found that the secret of success lies not in quantity, but decidedly in quality. The careful manner of selection by the members spells progress.

Sections

The autonomy of each section should be carefully preserved, and no rules made that will in any way handicap either their growth or progress; but, at the same time, I believe that we are now at a point where the recognition of the sections must be undertaken and such rules made for their guidance as shall prove most successful and convenient for all.

This will require the appointment of a committee not only to study the conditions of all sections, but also to make such uniform by-laws as shall least hinder their progress.

Your attention is also directed to the following sections, viz.: Eureka, San Jose, Santa Rosa and San Diego, inasmuch as at these points the effect of Association work has but scratched the surface. In only one of these sections are we represented, and that by only two members—one being on the Executive Committee. Some plan of action should be determined upon at this session and that determination should be put into operation.

State By-Laws

The absolute inadequacy of the State By-Laws more often than otherwise acts as a handicap to your Chairman. My conception of by-laws is that in them you will find some milestones to direct your attention. If this Association is to proceed along such lines that the members may have a little advance knowledge as to what is going to happen, a revision is needed of the By-Laws that may be a guidance to the officers. For example, the calling of elections is impracticable. The duties of the officers with the exception of the Secretary-Treasurer amount to nil. The duties and meetings of the Executive Committee are in the same category.

National Affiliation

The National Association affiliation has been up to our Association since October, 1917. That we should be members of the National Association was voted in the affirmative in

May, 1918. Again the matter was taken up in May of this year and another vote in the affirmative was registered.

The idle voting of Yes accomplishes absolutely nothing if not backed up by an effort to put it in practice. It seems that almost the entire membership favor belonging to the National Association, but when it comes to the financial question there is not the same unanimity of action.

The Executive Committee has planned what appears to be a solution of what was considered almost impossible, but even that, without the cooperation of the members, will not be entirely successful. Upon a very large attendance of the members, as well as their efforts, will depend the success of this undertaking.

It is the easiest thing in the world to join the National Association. All that is necessary is to pay the initiation fee and the dues. If we are to join the National, we will have to make such payments as the By-Laws of the National dictate. There is a large sum of money required to pay initiation fees and then a monthly or quarterly amount to be paid as dues.

At this session we must arrange to meet both of these items or not bother the officers in the future with resolutions that can only be complied with by additional legislation which seems impossible.

The Executive Committee have worked hard and evolved a plan that will in all probability pay the initiation fees, but the regular quarterly dues have to be gathered from the members and their willingness obtained.

It would be rather poor business to forward the initiation fees if the members are not going to pay their dues. Under the terms of the National By-Laws the dues are payable in advance. If the state officers are to send money for dues for all members, and the state is not reimbursed, the state treasury will be out of business in short order.

Therefore we all trust that the members will be so well represented that the financial side of the question will be met and for all time disposed of.

New Firms

The question of new firms entering the field is one that has now reached a point that requires the attention of the best and most fertile minds of our Association. Generally speaking, the poorer territory, and the towns that give the contractor-dealers the least hope of ever getting farther than being able to pay their bills, seem to be the Mecca for entry. If you will permit me to give an opinion, I shall say that at no better time than now can this question be coped with. I do not believe that we can hope for assistance from other branches of the industry; therefore, it is up to you gentlemen to make such plans and to determine upon some mode of action that will afford relief. Something must be done and your consideration of this subject at this time is all-important.

Trade Relations

Through the efforts of the Supply Committee, and the sub-committee in Los Angeles, our trade relations have been most amicable and encouraging. The future has a great deal in store for us if we proceed along conservative and business lines. Our relations with the central stations could only be improved by a more careful study of their needs.

Industrials

This has been the hardest of all problems with which we and the jobbers and manufacturers have been called upon

to cope. In the past it has appeared most difficult, owing largely to the fact that it has been attacked from the wrong point. The subject now is being treated by the Supply Committee merely as a wholesale and retail matter and gives promise of solution.

The question of serving the middle-class industrial is one that has to be determined now or never. If it is put off, you may rest assured that both the efforts of our committee and like committees of other branches of the electrical industry must go for naught. On the other hand, if you proceed to handle this subject in a business-like manner, the highest probability is that we will be successful. That this session must undertake an immediate solution and put that conclusion into practice is so essential that the very foundation of all our efforts is dependent thereon.

Committees

It is my desire to congratulate the various sections on their selection of Executive Committeemen. Their prompt attendance and earnest work deserve commendation. Sincere endeavor and prompt action have characterized their every effort. The various committees have also accomplished everything that might be expected. The members must not understand from this that they have no duty to perform. There are many things that they cannot assume. These, the membership is here to consider.

Cooperative Campaign

There is no question in any of our minds about the vast importance of the activities of the California Electrical Cooperative Campaign and the magnificent results obtained by the field men under the advice and direction of the Advisory Committee. At the present time there are four men employed in the work, which, if not 100 per cent, are as near that point as our members desire. These men are at the beck and call of our members and will endeavor to do all that is required of them.

There is a movement on foot to place a manager at the head who would give matters an added impulse and would in all probability coordinate the efforts in line with even bigger results, if possible, than now. An amount of \$20,000.00 is to be expended during the year 1919, of which this Association subscribes about two thousand five hundred dollars; two thousand as a cash subscription and five hundred in the form of expense for traveling and hotel expenses of three members of the Advisory Committee. To the writer's mind, this money makes the best showing of any money spent by this Association. Should the project of employing a manager be perfected, no doubt we will be called to increase our subscription and to that end your consideration should be directed.

HELPING THE VICTORY LOAN

A combination of the wireless telephone and the Magnavox receiver made possible the delivery of a Liberty Loan message from an aviator flying 1000 ft. overhead to a waiting crowd of 100,000 people in the New York streets. In the picture shown, E. S. Pridham of San Francisco, one of the inventors of the Magnavox is demonstrating the success of the instrument to the army officials. The aviator was actually flying overhead at the time, his voice coming out of the receiver magnified 100 times.

Coronado Convention

The second joint convention of the Electrical Industry took place at Coronado, which from every standpoint is considered a success. The attendance of the contractor-dealers was very good, taking into consideration the distance from the northern part of the state, yet we will hope for the day that a hundred per cent attendance will be looked upon as about right when we stop and think just how much it means to each individual firm. The next joint convention, from what I understand, is going to be programmed on the basis of discussing topics that are of interest to all branches of the electrical business, and more time is to be given to the "Commercial Section," as we are beginning to understand that the commercial part of our business must be successful if we are really to accomplish anything worth while.

Finally

The one big problem of each branch of the electrical industry is identical; that is, our transactions with the public. In our particular branch we have not only to sell and install what the public desires, but we have to take into consideration the central station. Our success depends on serving the public and at the same time serving it in a way that the central stations may also serve and receive credit that properly belongs to them. It is in the hands of the contractor-dealer to so administer his business that the ultimate consumer will be perfectly satisfied. I might even say enthusiastic, or quite the reverse. It is up to our members to so calculate the amount of lighting and the horsepower of motors that a mere drop in voltage is not going to spell failure in lighting and destruction of motors. Perfection can only be obtained by the proper consideration of all angles.

The central stations today, as never before, are exerting every effort to serve the public both faithfully and well. Is this not a most excellent opportunity for us to so expand the electrical field as to make it the cause of admiration and at the same time satisfaction? We must both by word and deed so serve the ultimate consumers that they, in no unmistakable terms, shall conclude that both sincerity and integrity underlie our dealings.

The central station is the "core" around which the whole electrical industry is wound. Upon its success or failure depends all success or failure of other branches; hence, it is our plain duty so to conduct our business dealings as to reflect credit upon the endeavors of all other branches of the industry; so to serve the public that no just cause of complaint shall exist.



Western Ideas

THE USE OF RELICS IN WINDOW DISPLAYS has a wide variety of possibilities, according to the writer of a recent article on the subject. Some curio which has a history, which belonged to or was used by some famous individual, has a human interest appeal which is invaluable in attracting attention. A bed slept in by the first governor of the state, an old spinning wheel used by some lady of long ago, a rusty weapon carried by a soldier of the Civil War—all these things are of a type which can frequently be found among old families in many American communities, and borrowed for display purposes.

A merchant tailor in Des Moines has for years been accustomed to put something new in the way of relics in his window each week. He has the best trade in his line of business, and this is due in no small degree to the fact that the people of the neighborhood have become familiar with his windows as a perennial source of interest and amusement.

Stamps, coins, old photographs, furniture, uniforms, in fact anything on earth which has the alluring halo of historical importance, age or sentimental association, can be utilized by the enterprising retailer in any line of business.

LANTERN SLIDES AT MOTION PICTURE SHOWS have been found by many dealers to be an effective medium for advertising purposes. The audience, however, eager for the five-reel drama, tends to be somewhat apathetic during the advertising display and needs some small stimulus to awaken its interest. A device which has been suggested in this connection is as follows: Let the screening of your slide be preceded by a hand-written announcement of a slide competition for the younger members of the audience:

"How would the boys and girls like to draw one of our slides for us? We want a new slide. For the best design submitted we will pay a dollar, and for all other designs used, fifty cents each. Originality will count the most."

It is pointed out that the children will prepare the designs at home, showing them to their parents, with the result that your slide will have particular

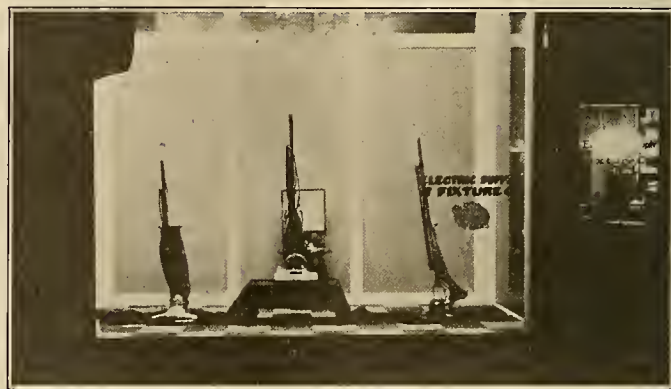
attention when it appears on the screen. Moreover, the children act as advertising agents by carrying back to the homes information about your goods and attracting attention to them in an exceptionally personal way which should be very effective.

ONE OUTSTANDING IDEA—that of the vacuum cleaners—is expressed by this window of the Electric Supply & Fixture Company of Walla Walla, Wash. It is not elaborated, but it is an idea that carries home to the passer-by from this neat and effective display.

"Are you taking a picture of that window?"

"Yes, sir."

"But you ought to take it when they have something in it."



This window illustrates the distinctive effect achieved by a window which avoids miscellaneous overcrowding

"Well, to be perfectly frank with you, that is my exact reason for taking the picture. Because the window has only that much in it."

Such was the conversation as reported by the photographer between himself and a passer-by. It typifies the usual haphazard idea sometimes held that a window is the store room of the shop.

A CARD SCHEDULE OF MEETINGS, small enough to be carried in the pocket as a memorandum, is a neat idea of the Pacific Service Employees' Association. This card, which is only the size of a postcard, schedules the monthly meetings for a complete year, with a brief outline of the program for each event. In this way it serves not only as a handy reminder but as a substitute for monthly notices and announcements.

PACIFIC SERVICE EMPLOYEES ASSOCIATION SCHEDULE OF MEETINGS DURING 1919 SUBJECT TO CHANGE												
	JANUARY 14 th	FEB. 11 th	MARCH 11 th	APRIL 8 th	MAY 13 th	JUNE 19 th	JULY	AUG.	SEPT. 10 th	OCT. 14 th	NOV. 11 th	DEC. 18 th
SAN FRANCISCO	20 Minute Entertainment 30 Minute Speaker 15 Minute Judicial Paper Dance	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	Dinner 17 San Francisco	Vacation- 17 Picnics	Vacation- 17 Picnics	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	Play Annual Dance	20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	Annual Show
OAKLAND	28 th 10 Minute Music 30 Minute Play Dance	25 th 20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	25 th Annual- Dance	22 nd 10 Minute Music 30 Minute Play Dance	27 th Play	19 th Dinner 17 San Francisco	Vacation- Picnics	Vacation- Picnics	23 rd 20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	26 th 20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	25 th 20 Minute Entertainment 30 Minute Speaker 15 Minute Paper Dance	16 th Annual- Show 17 San Francisco
MARIN SACRAMENTO PLACER STOCKTON SAN JOSE MARYSVILLE			22 nd	19 th	17 th				20 th			
DISTRICT MEETINGS										KEEP THIS CARD FOR FUTURE REFERENCE		
										18 th	22 nd	

The events scheduled on this compactly arranged card comprise the programs for an entire year of monthly meetings. The back is utilized to list officers and committees of the organization. The original card is the size of an ordinary post card, and can be carried conveniently in the pocket as a permanent memorandum.

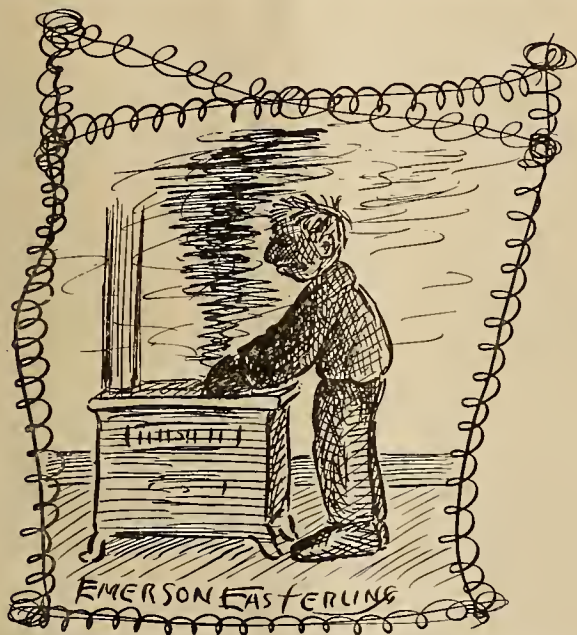
What the Public Doesn't Know

BY EMERSON EASTERLING

(Unlike some jokes, this one has a point. The author is convinced that most of the problems of the electrical industry would be solved if the general public knew more about electricity. In spite of the implication in the title, all the responsibility is not laid on the customer: cooperation between branches of the electrical industry is one of the most necessary factors in achieving the education of the benighted public.—The Editor.)

As I stepped into the central station I perceived "Olaff," the station man, and a local contractor-dealer engaged in conversation.

"I sold an old jay an electric stove the other day," said the contractor, swinging his feet from the desk, "and he came back and said he did not want to keep it. He said that he was afraid of it. I asked what was the matter with it that made him afraid,



Some people are still in the dark ages—especially those who use coal stoves

if the thing had failed to act as it should or if he had a 'jolt.' He said that he had read in the paper of a man getting killed by electricity and that he was not going to have anything to do with it—the old wood stove answered his purpose all right."

Blowing Off the Gas

"That is just the trouble with a lot of our hicks here," agreed Olaff, "they need education in the electric line. They look at it as some sort of black art, and I suppose at us as a bunch of black artists. Through years of contact they get accustomed to the instantaneous combustion type of heat and since some old geek's half uncle did the Boob McNutt stunt with the old gas meter ticking off the feet, the general public have come to learn that gas should not be turned on and left for any appreciable length of time without either lighting or burning off, especially in a close room. They kick at the gas bill about as bad as the electrical statements of consumption, but I doubt if they kick at the peeled up varnish as bad as they do when a heater goes on the fritz or some other appliance hits the junk pile.

Explaining to the Housewife

"Some of our customers are almost human in

their apprehension of what they should get for the \$ in the line of wattic service. Some can understand kw.-hours and some even that it is natural for their service to be broken in such weather as the winter months slip us with their icy ingratitude. Some of the housewives that can hardly turn on a light stand for hours trying to tell us what was the matter with their lights after we have fixed them. Others keep us off our other jobs trying to find out what is the matter with the light when it will not turn on. Here is where the run of linemen make their mistake—they peddle the honest housekeeper a line of dope that either satisfies or leaves them standing with their mouths open wondering what they were really talking about in common every-day English. They should tell them what was the matter if it is something that they can understand, and if it is not they should explain that it was something that they could not see through but that it was an imperfection or result of some accident, but in no case should the workman impress the public that the producers are inefficient nor that they were at fault. He should point out that the cause was due to wrong usage or environment—of course, if that was the cause. Bull and Business don't mix as well as some think it does, if you play the game straight you get where the crook can't even look in—and of course the crook gets where you do not care to look. What I mean is that we are cooperating with the public, they buy our products—juice (in your case, appliances), and we sell them juice and not jaw. You know what our tallest President said about fooling the public—you can't fool 'em all the time."

A Shocked Customer

"You talk like I have been trying to fool the people," returned the dealer. Then he laughed. "What you said about the public being ignorant on the electrical subject makes me think of a party that was looking at a range over at the store. He was afraid to touch the elements for fear they should shock him. I told him they were not connected up but that made no difference—he would not touch them. Such people as that would be living at the top of a twenty-foot rubber step-ladder in a pair of gum boots and have their meals served a la Christy Mathewson if they knew that we had heavy currents grounded.

"More and more we—you and I, contractors and central stations—we are coming closer together. As McKinley said, 'Progress is made in concord, not conflict.' The better service we give, the better field you have for appliances; the more appliances you sell, the more we have to furnish juice for. Then when the public gets more educated electrically, we will be a step farther along in the game.

Showing Them

"Yes, people are beginning to see that the vacuum cleaner has it over on the old dust raising broom. When Mrs. Tidy has just done what she thinks is an A-No. 1 job with the bristled stick and you come along shoving your suction cleaner leisurely and then empty from the bag a wad of dirt that would choke a harvester, she just can't think what she used to of the old method. We have got to show them. They are all from Missouri.

"However, one old duck was not hard to show that the electric heat had it on the old smoke and ashes system. He ambled in from a hard night and thought a cup of black coffee would better his condition somewhat. After a vain search he became



This is the author's idea of the state of the public's mind with regard to electricity.

aware of the fact that fires are not of much use in their pre-material state—the idea is that there were no matches in the house, and even gas needs some means of ignition. He connected up his toaster and wondered why he did not think of it sooner. After a talk with me the next day he purchased a percolator; now he has a range.

She Forgot the Clock

"A lady came in the other day and wondered why her light bill was so big. I asked her if she had bought any new appliances. She said that she had purchased a headlight heater—but that the man that sold it to her said it did not use any more juice than an iron, and she could not see why her bill was so large on that account. After I explained that she did not keep her electric iron going day and night but did the heater she began to comprehend the fact that time used, and not the name plate rating, has a lot to do with the kw-hours that she has to pay for. The trouble with some of the people is that they do not think.

"Last month I sold a woman an electric range who was as badly in love with the old style stuff as Romeo with Juliet. She was a dressmaker and said she had to work for her money and wanted to economize as much as possible—said she could not afford the range. I agreed to install the range for her and let her use it gratis for one month. If, at that time, she was convinced, the range would remain, if not I would remove it and call it a bad seller. The result was that she figured that she saved more time with it—that the extra time she was able to put in on her work justified the buy. She thinks the time clock attachment is a wonder. It is.

"That's the idea, educate them by example. If we have more customers we can give more efficient

and cheaper service. If you make more sales you can give better service and in some cases make better prices. We all profit by the condition.

Encouragement from the Central Station

"The best way to do is to have the customers use enough juice to justify a heating rate and then run their appliances on that rate. It gives them more for their money, you see. If you would encourage that it would be a good thing. We could set special heat load transformers to handle the customers, if there are enough, easier than putting them on the light circuits. Then when about a dozen houses hook up their heat for cooking the lights will not burn at half mast in the houses. A few heaters can make a difference in the brilliancy and yet not justify putting in a larger pot."

"Oh, yes; by the way," broke in the contractor, "I've got a new line of—"

At this point a lady stepped in. "My lights won't light at all," she complained, "they never did do that way before. I can't think what is the matter with them. Will you send a man over to fix them right away? I have a sister from Waco, Texas, for dinner and I simply must have the lights on by then."

"Awright," replied "Olaff," "We'll 'tend to it right away." Then, after she went out, "That's them every time—that never happened before," just like there was not a first time for everything."

CUSTOMERS' COMMENTS

(Here is a new idea. Perhaps we are wrong in urging a too great singleness of thought in window displays. This quotation from the remarks of one of the "public" suggests that there is room for more than one type of appeal to the interest of the passer-by.—The Editor.)

The other day I learned that a variety in exhibitions is needed to meet the tastes of the variety of window inspectors. What appeals to one often has no charm whatever for another. I have seen men, women and children intently studying the contents of a window that, at first glance, appeared to me as an unpardonable jumble. One day I joined such a gathering, wishing to know why they were interested. I soon heard a young woman say, "That is the kind of electric fan I must have in the living-room." The young man at her side, evidently an admiring husband, quickly led the way into the shop, as he answered, "We will get it now."

An old man with dim, squinting eyes, moved into the place they had made vacant. In a few moments joy brightened the wrinkled face, and the man hastened to a young girl who was waiting a few feet away. Joy came to her face, too, when he told of the lamp in the window, describing it as just the thing for his "poor old eyes."

My attention was next attracted to a beautiful little girl about ten years old. She was pulling her father's coat as she whispered, "Daddy, look at that stove with oven and everything. Let's get it for mama."

Near them was a pale, thin girl. She was trying to get a "good look" at some heating pads on the side of the display farthest from her. Someone

moved and she more clearly saw a small pad, plainly marked "\$4.00." She joyfully turned to her companion with the words, "There is a pad that I can afford. What a joy it will be these bitter, cold nights. I'll get it now."

These patrons of this shop would have passed, without a moment's stop, a window in which an artistic arrangement of a few articles presented nothing of special use to them. Thus I learned that dealers in electric supplies have the tact, the good judgment, and the skill to present to all opportunities for seeing and obtaining the marvels that ingenious man with the aid of electricity has been able to give to the world.

A CUSTOMER.

CONSERVING OFFICE SUPPLIES

BY W. H. BROMMAGE

(Here are a few suggestions for conservation as they were pointed out by the supply department of the Pacific Telephone & Telegraph Company in the company magazine. They are too good not to pass on.—The Editor)

- Don't throw away ends of lead pencils unless they are too short to use in a pencil holder.
- Don't fill your vest pocket with pencils. One should suffice. They cost you nothing but they do cost the company something. Have a house cleaning once in a while and when you find a dozen or more pencils at home on the mantel piece or on the bureau and in the drawers, bring them back to the office where they can be used. They can not be used when lying flat.
- Don't puncture your pencil erasers with your pencil and bend the eraser backward and forward until it breaks and then throw it in the waste basket and ask for a new eraser. We will certify to the fact that rubber is pliable and will bend easily because we have tried it ourselves, and can save you that much time in experimental work.
- Don't make it a practice of emptying your pin cup into the waste basket just because some dust has settled amongst the pins. If pins are emptied on the desk or on a piece of paper the dust can be blown from the pins and the pins replaced in the cups. You will find they will be just as sharp and efficient as new ones; besides, the janitor may receive injuries in emptying the baskets and that would be sad. You know how it feels to have a pin stuck in your finger.
- Don't bend paper clips into designs different from the manufactured articles. We are all more or less mechanically inclined and can make several bends and twists to the clips, but it serves no purpose. They don't cost much, but when distorted can not be used over again.
- Don't let the office boy fill his pockets with rubber bands if you know of it. That is a sure indication that he is either a practical joker or a baseball bug. A practical joker likes to hit you with a rubber band stretched to the limit, when you are not looking. It stings fine. A baseball bug uses the company's time and rubber bands constructing home-made baseballs and they sure bounce. We would prefer to buy a bow and arrow or a real ball for the boy, as we would save money not only in material but in his time.
- Don't destroy tension envelopes that you receive with your name on, because they can be used again. If your name is crossed out with pencil you can send the same envelope to some one else by writing the other fellow's name underneath yours, or elsewhere. The contents will not be damaged merely because your name is on the outside of the envelope; besides, you are advertising yourself and letting the other fellow know you are somebody, otherwise the envelope would not have been addressed to you. It might surprise you to know how many perfectly good tension envelopes are destroyed daily and thrown into the waste basket. It all means money.
- Don't use bond second sheets for scratch paper. If any one tells you that the standard scratch paper is not good enough for your purpose, just try it yourself. You will find that if your pencil is sharp you can sketch all kinds of things on it and figures show up splendidly; besides, it is put up in pads and the sheets hang together much better than bond which is loose and not nearly so convenient to use. Scratch pads are furnished in three sizes. If the full size is too large, you have your choice of two others.
- Don't replace your typewriter ribbons more frequently than necessary. They are usually made of Sea Island cotton. They look like silk and act like silk, but the girl who takes them home to wash them out and thinks she has so many yards of silk for other purposes discovers her mistake. The dye can not wholly be removed, no matter how hard you work; the soap and water used does not pay for the trouble. We have tried it. Let them stay in the machine as long as serviceable. Others will be furnished when required.
- Don't start the day's work with clean blotters. You will be surprised to learn how much ink can be absorbed before they are useless. The best place to determine this is in the pawn broker's shop. The next time you pawn anything look at the blotter Uncle uses when he makes out the pawn ticket and then ask him how long he has used it. He may tell you five years, but you can add five more to it and be safe; and then you could not tell what the original color was. A clean blotter means nothing, but a soiled blotter shows there has been some activity on the part of the user.
- Don't waste ink. Dust and other foreign matter is not held in solution but forms a deposit at the bottom of the ink well. Dust may be greatly avoided if the wells are covered at night. The janitor is largely to blame because it is his job to raise a dust and we pay him for doing it, but he can not hold one hand over your ink well and sweep with the other. One per cent of the ink may be bad but that is at the bottom. The other 99 per cent is good. Don't throw it out. The ink man makes his fortune on the amount of ink that is thrown away and would go broke if he could only charge for the ink actually used with the pen.
- Don't waste twine as though there were no end to it. There is an end to everything and two ends to each ball of twine. A package need not be tied with so much twine as to look like a fish net. Just enough to make it secure. Did you ever watch your wife save all the twine that comes on her bundles? She cuts it near the knot, rolls the twine on her fingers, ties it up and places it where she can use it again. That is economy, but don't attempt to save the string by picking open each knot. If that piece of twine costs \$.00001 and the time it takes to untie it costs \$.01, that is foolish. We are referring to the company's time. In your own home take all the time you can. Your wife would rather have you there than at the lodge.
- Don't think that we feel like continuing these "Don'ts" indefinitely. We have other things to do and time is precious. Material means money, and, talking of time, time means money and both go hand in hand.
- Don't waste material. Don't waste time. Think this over.

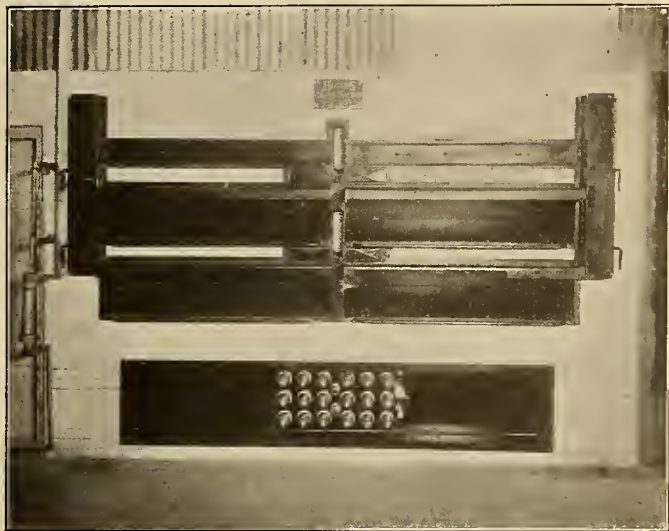
Testing a Large Bake Oven

(Here are the results of recent tests on the largest electric cooking installation west of Salt Lake City. This large bake oven of the Haynes—Foster Baking Company was described in the Journal of Electricity of January 15, 1918 at the time of its installation. It is reported to have been giving perfect satisfaction.—The Editor)

The result of a recent test on a large bake oven installed by the Haynes Foster Baking Company, Inc., of Portland, Oregon, is evidence of satisfactory results obtained from this oven in use.

The oven is a Hughes No. 415 with a capacity of 650 12-oz. loaves and is a continuous baking oven. The electric power used is a.c. 220 v., 3-phase, 60 cycle, and the total current that can be used at any one time is 210 amperes, the heating elements being balanced between the three phases.

The heating units consist of six heat units, each divided into three separate sections, with each sec-



650 12-ounce loaves can be baked in this oven at once. The average kw-hr. consumption for 1000 loaves was 70 for the first test, and 67.4 for the second.

tion controlled by a three heat snap switch. The temperature used is from 400 to 500 degrees Fahr.

RESULTS OF TEST ON NO. 415 HAYNES OVEN--OCT. 17, 1918						
Date	Hours Operation	Kw-hr.	Loaves 12 oz.	Average kw-hr. per hour	Average loaves per hour	Average kw-hr. per loaves
Oct 7	11¾	688	9834	50	837	59.8
8	11	657	9911	59.7	901	66.3
9	9	670	7483	63.3	832	76
13	14¼	1024	13,286	71.9	932	77
Total 4 days	46	2839	40,514	61.7	881	70
Daily average	11.5	710	10,128			
SECOND TEST -- OCTOBER 23-24-25, 1918						
Oct. 23	8½	545	8671	64	1020	62.8
24	12¼	735	10,314	60	842	71.2
25	10	653	9688	65.3	969	67.4
Daily average	10¼	644	9558			67.4

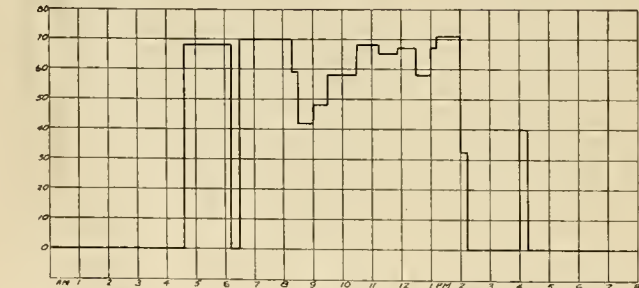


Fig. 1—Result of test of Oct. 7, 1918—11¾ hrs., 688 kw-hrs., 9834 12 oz. loaves.

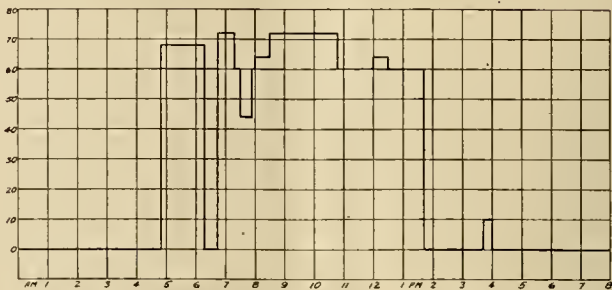


Fig. 2—Result of test Oct. 8, 1918—11 hrs., 657 kw-hrs., 9911 12 oz. loaves.

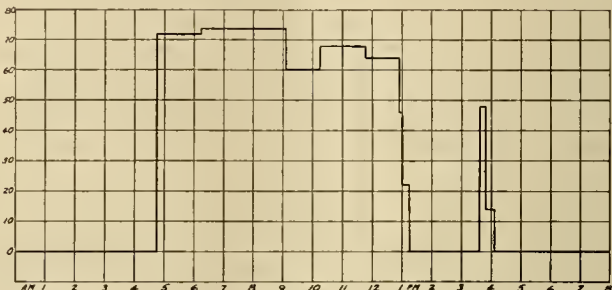


Fig. 3—Result of test Oct. 9, 1918—9 hrs., 570 kw-hrs., 7483 12 oz. loaves.

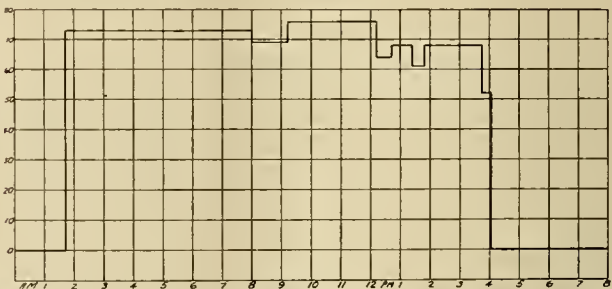


Fig. 4—Result of test Oct. 13, 1918—14¼ hrs., 1024 kw-hrs., 13286 12 oz. loaves.

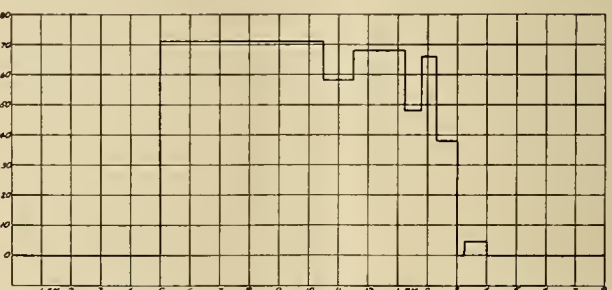


Fig. 5—Result of test Oct. 23, 1918—8½ hrs., 545 kw-hrs., 5399 18½ oz. loaves and 348 12 oz. pies—equivalent to 8671 12 oz. loaves. Average 62.8 kw-hr. per 1000 12-oz. loaves.

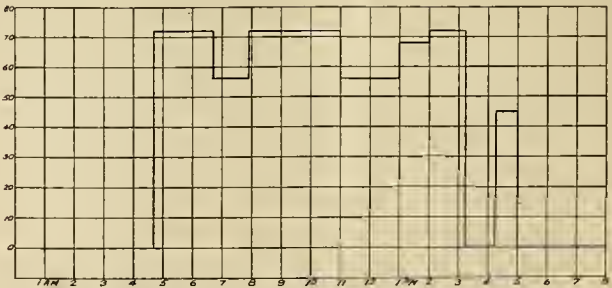


Fig. 6—Result of test Oct. 24, 1918—12¼ hrs., 735 kw-hrs., 10314 12-oz. loaves. Average 71.2 kw-hr. per 1000 12-oz. loaves.

Building an Electric Cooking Load

BY GLENN D. SMITH

(A greater proportion of the customers of the Ontario Power Company cook electrically than is recorded by any other company. The success of this one of the smaller California power companies in building up a substantial cooking load here told by the general manager of the company will be of interest to others handling similar loads. The paper formed part of the discussion of the report by Ben M. Maddox on Electric Cooking at the recent Coronado Convention.—The Editor.)

The Ontario Power Company, with 2348 residence customers, has on its lines 262 cooking installations, being used regularly. This is one cooking customer for each nine residences served. The number of ranges sold seems small, perhaps, when compared with the sales of the large companies, but the percentage of customers cooking electrically is, so far as I have been able to learn, much greater with the Ontario Power Company than with any other company on the Pacific Coast or elsewhere.

A Satisfactory Residence Load

This cooking load is not due to any unusually favorable conditions within the territory served, but is due to the fact that, realizing that our company must look largely to the residence load for its growth, we have persistently worked to build up that class of our business. We in no way neglect the other classes of service, but our opportunity in the industrial field is small and the residence load is our big opportunity. It is possible that some companies have been deterred from actively seeking the cooking load by the thought that to get it would require a rate so low that there would be no margin of profit after allowing for cost of service, including the attention necessary to be given to the ranges. We have not found it so. The ranges, we find, after three years' experience, require but little attention, but this branch of the service should be prompt and courteous. The Ontario Power Company has the following combination rate, which is available for all residence service:

First	20 kw-hrs. per month.....	9c
Next	130 kw-hrs. per month.....	3c
Over	150 kw-hrs. per month.....	2c
Prompt payment discount, 10%		
Minimum charge, \$2.00 per month		

In August, 1918, the Ontario Power Company had 249 cooking customers, delivered to them 34,235 kw-hrs. of energy, and received \$1,187.00 in revenue, or 137 kw-hrs. and \$4.76 per customer. The revenue per kw-hr. was 3 47/100 cents. In December, 1918, the company served 262 cooking customers, delivered 49,302 kw-hrs. to them and received \$1,455.00 in revenue, or 188 kw-hrs. and \$5.55 per customer, the revenue per kw-hr. being 2 95/100 cents.

For the year 1918, we delivered to our cooking customers 483,515 kw-hrs. and received \$15,447.82 in revenue, equaling 3 2/10 cents per kw-hr.

Encouraging Other Uses

The increased average consumption in December over August was due largely to some of the cooking customers using air heaters. The experience of this company indicates that cooking electrically leads to the use of air heaters and helps to popularize the use of all electrical appliances in the home, and is

a large factor in developing the idea of the Electrical Home.

The Question of Electric Water Heating

We have installed very few equipments for heating water electrically, and though there seems to be a very general opinion that to equip a home for cooking electrically, it is necessary to also provide for heating water electrically, we have not found that it is necessary. The writer recognizes the desirability of providing for heating water electrically, both from the viewpoint of the user and the company, but not being sure of the best method of doing it and firmly believing that it is bad business policy to install any electrical appliance in the home that might prove unsatisfactory and lead to complaint, has been content to wait for possible improvements in water-heating appliances.

Costs of Maintenance

This company has not found the cost of taking on this business at all excessive. It has not been found necessary to increase the capacity of primary lines. Heavier services are required and transformer capacity has to be increased. For a range, lights and the usual lamp socket appliances, we install a 3 kva. transformer; where air heating or water heating is done, a larger transformer is installed. When a range is installed, we make a voltage test with everything on and require a minimum voltage of 107. This has proved to be entirely satisfactory, as indicated by the lack of complaints, and I assume that our users are as exacting and as critical as any group of users would be. Range elements will burn out, and when they do, should be very promptly replaced. We do not find the cost of replacements high, and we make no charge for it. The burned out elements are repaired in our own shop and installed in another range when needed. We find that at least 90% of the elements brought in can be repaired.

A careful analysis of all cost connected with, and the revenue from, the cooking business, shows that the net annual return from one cooking customer equals that of four lighting customers; consequently one cooking installation can stand four times the initial investment on one lighting installation.

The Character of the Load

We have no way of determining just what the demand of the cooking load is, but a careful analysis of our load curve indicates that it is about 175 kw., the maximum being in the forenoon and the use being rather uniform during that period, and coming on again at a lower demand about five o'clock p.m. and continuing until about 6:30 o'clock.

Unquestionably electric cooking is here to stay.

New Electric Pumping Units for Portland Water Works

BY F. D. WEBER

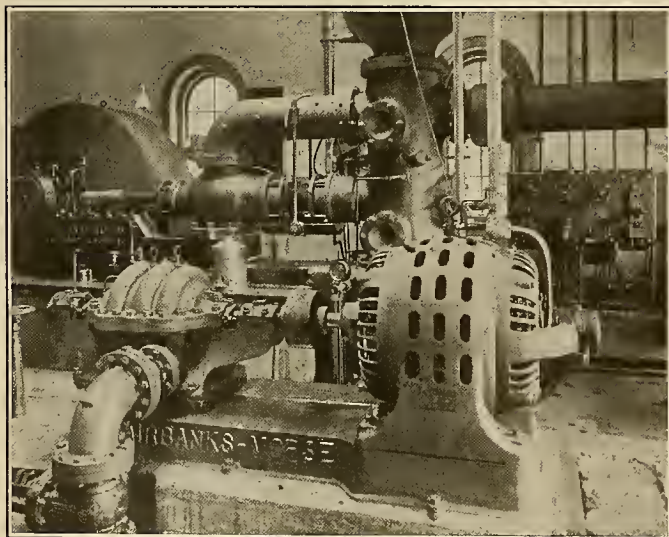
(Among important new electric installations in the Northwest are these pumping units in the Portland Water Works. The Fairbanks-Morse Company has supplied the city with additional pumps and motors to meet the needs of full-capacity operation during the "peak load" periods of the summer months, and to act as spare units in the old plants.—The Editor.)

The water supply for the city of Portland is obtained by a diversion from Bull Run river, about 30 miles from the city, and flows by gravity through two steel conduits to reservoirs within the city on each side of the Willamette river, and is distributed by gravity from them to six principal services, with nine higher districts supplied by pumpage and several lower sections under reduced pressure.

The capacity of these pipes per day is 65,500,000 gallons.

The following units were necessary, because of the fact that the plants were operating at full capacity during the "peak load" periods of the summer months, and also the fact that no spare units existed, making breaks or repairs to the old plants during the summer months liable to leave these districts without water.

On December 8th, 1917, a contract was entered into by the city with the Fairbanks-Morse Company for the following pumps and electric motors:

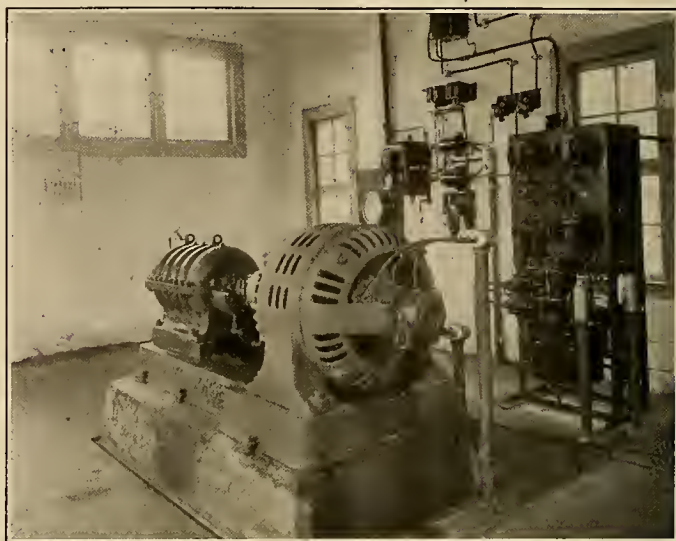


These two Fairbanks-Morse 5 in. 3 stage horizontal centrifugal pumps, comprising the City Park units, are direct connected to a 100 h.p. 2200 volt motor.

City Park Station.—Two Fairbanks-Morse Co. 5 in., 3 stage bronze fitted horizontal split case centrifugal pumps, direct connected to Fairbanks-Morse 100 h.p., 1800 r.p.m., 2200 volt, 3 phase, 60 cycle, type BV, slip ring induction motor. This includes a slate panel on pipe frame having mounted upon it one Bulletin No. 9410 Cutler-Hammer drum type starter, arranged for rear of board operation and operated by bevel gears; one Bulletin No. 10080 C-H phase failure or reverse relays, and Westinghouse S-2 oil circuit breaker with no voltage and overload relay and mechanical interlocking between primary circuit and drum. The pumps have a capacity of 700 gallons per minute, against a total head of 300 feet, when operating independently, and have a combined capacity of 100 gal. per min. when the two are working in series against a total head of 600 feet. The specifications called for an efficiency of 61% on each pump when working independently against 300 foot head and upon test they showed 64%.

Fulton Park Unit.—One Fairbanks-Morse 75 h.p., 1800 r.p.m., 2200 volt, 3 phase, 60 cycle, type BV slip ring induction motor, direct connected to a 3 in., 5 stage Fairbanks-Morse bronze fitted, horizontal split case centrifugal pump.

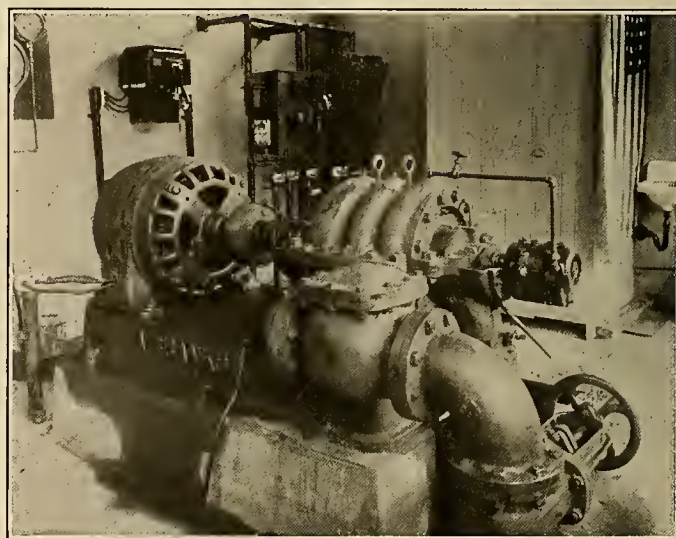
This includes a slate panel switchboard on pipe frame, having mounted upon it one Bulletin No. 9642 Cutler-Hammer secondary type self-starter, with two inverse time element over-



The Fulton Park unit—one Fairbanks-Morse 75 h.p., 1800 speed, 2200 volt, 3 phase, 60 cycle motor, direct connected to a 3 in., 5 stage centrifugal pump.

load relays and one Bulletin No. 10080 Cutler-Hammer phase failure relay and step down transformer for operation of the primary and secondary switches. The unit has a capacity of 250 gallons per minute against a head of 430 feet. The specifications called for an efficiency of 55% and upon test the unit showed 55%.

Council Park Unit.—One Fairbanks-Morse 40 h.p., 1800 r.p.m., 220 volt, 3 phase, 60 cycle, type BV, slip ring induction motor, direct connected to a 3 in., 3 stage Fairbanks-Morse bronze fitted horizontal split case centrifugal pump. This



The Council Crest unit consists of one Fairbanks-Morse 40 h.p. 220 volt, 3 phase, 60 cycle motor, direct connected to a 3 in., 3 stage centrifugal pump.

includes a slate panel switchboard on a pipe frame, having mounted on it one Cutler-Hammer Bulletin No. 9640 secondary resistance type self-starter, with two inverse time element overload relays and one Bulletin No. 10080 reverse current and phase failure relay. The unit has a capacity of 350 gallons per minute against a total head of 235 feet. The specifications called for 55% efficiency and upon test the unit showed 55%.

Providing Heat and Power for the Modern Office Building

BY O. B. GOLDMAN

(That a profitable source of power is being overlooked in the modern office building heating plant is here pointed out. The development of by-product power is too often neglected—a fact which puts an additional load upon the public service at peak hours and at the same time means a great loss of revenue to the owner of the building. The following calculations represent extracts from a lecture on central heating presented by the author as part of a course in steam engineering under the auspices of the Extension Service and School of Engineering of the Oregon Agricultural College.—The Editor)

Centralizing Service —

Heating service is being centralized. In building, we had originally a stove in each room. Now, we have a central plant in each of the larger buildings. In residence districts the buildings are comparatively small. Consequently the heating plant must be comparatively small if one is placed in each building, and therefore their first cost per unit of service rendered is very high. So also is the attendance expensive and bothersome, while the service rendered is comparatively poor. Where this residence service is centralized, the first cost of the heating plant and attendance is low, and good. We have, however, added another item of expense, that of transmission, for the heat must be transmitted from the central plant to each house. For small areas this cost of transmission is a small item, but as the area served increases this becomes a larger and larger item, offsetting more and more the gain in greater centralization, until we finally arrive at a point where greater centralization, instead of decreasing the cost of heating service, actually increases the cost. Under any given conditions there is a certain size of central plant which can render this service most economically. Increasing or decreasing the size of this unit raises the cost of the service. It is not the largest any more than the smallest plant that can render the service most economically.

The Central Plant in the Business Building —

In the business district centralization took place in the utilization of one main unit to serve an entire building—perhaps an entire block. To serve a modern business building requires no mean central plant. In fact, very often they are of quite impressive size. The Old National Bank Building in Spokane, Washington, contains 500 h.p. of boilers; the Claridge Hotel of New York, 720 h.p.; the Customs House of New York contains 1200 h.p., while the central plant of the Hotel St. Regis of New York contains 1450 h.p. Many a district heating system would feel quite important with a load such as one of these large buildings offers.

An attempt to put in a district heating system in the business district is, then, an attempt to centralize heating plants. The cost of steam generation in such a plant would be nearly as great as in the local plant per pound of steam generated, but to this must be added the enormous cost of transmission. No doubt, however, but that some of the smaller down-town buildings could be served from the larger, profitably to both sides of the bargain. But general centralization would result in a much increased cost.

Furthermore, heat is not the only service to be rendered. The power demand in the modern buildings is often so large as to surprise the uninformed. The question then naturally arises, to what extent these services can be combined with increased economy. Besides all this, there are a great many services to be rendered by the engineering staff in a large building whether heat and power are generated or not. The heat and power must be distributed, ventilation and the like provided, which make it possible to combine to a great extent the generation of power and heat with these other services, reducing further the cost of attendance. Inasmuch as the heat, power and the other necessary services are practically all demanded during the same period, it is particularly desirable to combine them.

Combining Heat and Power —

In a steam power plant generating power from fuels we can convert approximately 20% of the heat in the steam into power if we run condensing. If we do this, then the temperature of our exhaust is only 100° approximately and irrespective of the impracticability of the maintenance of a long pipe line under vacuum, and the great and correspondingly expensive sizes demanded, the temperature would be too low for practical heating. On the other hand, if we wish to use the steam for heating, we cannot expand below atmospheric pressure. If we expand just to this pressure, then in a fairly well designed plant we can get 10% of the heat in the steam converted into power, or only half as much as if we run condensing. On that basis, 90% of the heat is left in the steam after expanding to atmospheric pressure in the engine, the other 10% being converted totally into power.

In order to reduce the cost of transmitting the heat, the steam is often supplied to the transmission pipes at boiler pressure. In that event, no power is generated, and all the heat is available for heating. So we can get any one of the following or intermediate results:

- (a) 20% power, no heating
- (b) 10% power, 90% heating
- (c) 0% power, 100% heating.

Which of these, or what intermediate result we wish to obtain, depends entirely on the market price of each commodity, heat and power, and the cost of transmitting each to the place where it is to be used. You can see at once that because the transmission of power electrically is very much cheaper than the cost of transmission of heat in expensive pipes and tunnels, a correspondingly larger area can be served with power from a central station than with heat.

Rates for Central Heating —

Where district heating companies operate, there are two methods of selling the heat. First, that of a flat rate, and second, that of a meter basis. The flat rate charge in such districts as in Chicago where the winters are quite severe, but fuel is low compared with Coast prices, is between 25 and 35 cents per square foot of radiation per year. Where the charge is on the meter basis, the cost per 1000 lbs. of steam varies with the locality and the quantity of steam used.

The Illinois Maintenance Company, with offices in Chicago, offers two forms of contract, in one of which the customer furnishes the steam generating equipment on his own premises, the company operating the plant, and in the other he does not, the heat being furnished from a central plant. The rates charged on each schedule are given below as taken direct from copies of their contracts.

RATES FOR STEAM FROM CENTRAL PLANT
(Illinois Maintenance Co.)

First	10,000	pounds	of	steam	per	month,	\$1.50	per	M.
Next	10,000	"	"	"	"	"	1.00	"	"
Next	10,000	"	"	"	"	"	0.80	"	"
Next	50,000	"	"	"	"	"	0.70	"	"
Next	120,000	"	"	"	"	"	0.60	"	"
Next	200,000	"	"	"	"	"	0.55	"	"
All over	400,000	"	"	"	"	"	0.50	"	"

Conditions:

- All rates subject to a cash discount of 10%.
- Continuous service not guaranteed.
- Consumer must guarantee not to use any of the steam furnished him for the generation of electricity.

RATES FOR STEAM OF ILLINOIS MAINTENANCE CO.
(Steam Generating Plant Provided by the Consumer)

First	50,000	pounds	of	steam	per	month,	\$0.80	per	M.
Next	50,000	"	"	"	"	"	0.70	"	"
Next	200,000	"	"	"	"	"	0.60	"	"
Next	300,000	"	"	"	"	"	0.50	"	"
Next	400,000	"	"	"	"	"	0.45	"	"
All over	1,000,000	"	"	"	"	"	0.40	"	"

- All the above subject to a discount of 10% for cash.
- Consumer must furnish a complete generating plant on his premises.
- Company has the right to generate excess steam and sell it to others without paying the customer for the extra use of his equipment.
- Consumer guarantees not to use any of the steam furnished for the generation of electricity.

The last clause in each contract is very interesting, for as we shall find that is a very economical thing to do at present commercial rates on power.

Power Service in Office Buildings —

If steam for heating is purchased instead of being generated on the premises in the modern business building, the engineering staff is required to cut down but very little. The following service has still to be rendered, and the necessary equipment therefore attended and maintained.

- Hot water heaters for industrial or domestic use.
- Vacuum pumps for heating system.
- House pumps for domestic water supply.
- Elevators.
- Fire pumps.
- Air compressors or blowers.
- Refrigerating machinery.
- Brine pumps.
- Drinking water pumps.
- Ventilating fans.
- Air washers.
- Vacuum sweeping system and many miscellaneous other services.

Where steam and power are both purchased, we need the whole engineering staff, less boiler and engine attendants. Where the steam is locally generated but the power is purchased, we need the whole staff, less the engine attendant, while where the heat and power are both locally produced, we need the entire staff. The reduction is very little because of the multiplicity of other services that a modern

building demands. However, when the heat and power is generated at a distance, we must add to the cost of generation the cost of transmission, which is very large for heat. While also, the larger boiler plants are more efficient, this gain is much more than offset in the heat lost in transmission. This assumes that the local plant is of fair size and fairly well designed. It would be hard to set down just what a fair size is, as this is quite variable. At present, we can assume it to be in the neighborhood of 150 boiler horsepower minimum.

As to continuity of service, we should consider a local plant consisting of two or more boilers much safer than a greater number of boilers at the end of a single long pipe line with a corresponding greater demand.

Costs of Heat and Power —

In order to more clearly illustrate the heat power engineering of the large business block, let us take as a concrete example, a building 200 feet by 200 feet and ten floors, each one 14 feet high.

The heat radiated in B.t.u. per hour, by the formula $H = (G + .25 W + .02 NC)T$, amounts to 16,380,000 B.t.u. Allowing for roof radiation, etc., we would require about 17,000,000 B.t.u. For heating, we would therefore require 17,000 pounds of steam per hour at atmospheric pressure.

This is not the only service that the modern building demands. Power service is equally essential. If we generate the steam at fairly high pressure and superheat we can readily get 10% of the heat of the steam converted into work, exhausting against atmospheric pressure. This leaves available for work some 2,000,000 B.t.u., which will develop about 680 effective h.p.

For average good lighting with nitrogen filled lamps, there will be required 0.5 watts per square foot of floor surface. In the building under consideration, we have ten floors each of 40,000 square feet area, or a total of 400,000 sq. ft. This will require $400,000 \times 0.5 = 200,000$ watts = 200 kw. or 270 h.p. approx.

The cubic contents of the building we found to be 5,600,000 cubic feet, and since we change the air twice per hour, we will have to displace 11,200,000 cubic feet per hour or 187,000 cubic feet per minute. We can handle about 2,500 cubic feet per minute per h.p., so the horsepower required by the fans will be about 80 h.p. Allowing for five elevators at 20 h.p. each with additional load factor of 50%, we would require for this service an additional 50 h.p. And allowing 30 h.p. for refrigeration and 50 h.p. for miscellaneous service, we would require a total of 480 h.p. But as we have seen, we can easily produce on the basis of 10% conversion of heat to power 680 electric h.p., leaving therefore a surplus of by-product power 200 h.p.

If we produce this power during ten hours a day and 300 days a year, we would be able to sell above our needs some 600,000 h.p. hours, which at one cent per h.p. hour would net us \$6,000 per year. By using better engine equipment we can, with atmospheric exhaust, increase the thermal efficiency by about one-third, producing a corresponding larger amount of by-product power, or approximately 900 h.p., leaving a surplus of 420 h.p., which at 3000 hours per year and one cent per h.p.-hr. would net us over \$12,000 per year.

To produce the above heat and power requires approximately \$23,100 per year for fuel, with fuel oil at \$1.50 per bbl. If 10% of the heat is converted into power, then evidently 10% of this fuel is chargeable to power, or \$2310. However, besides getting 480 h.p. for our own use, the surplus power at one cent per h.p.-hr. is worth \$6,000, or nearly three times the total power cost. Or to look at it another way, we develop a total of 1,940,000 h.p.-hr. per year. Therefore the cost for fuel per h.p.-hr. is .12 of a cent. Allowing 50% extra for attendance, fixed and other charges, our total cost per h.p.-hr. would be 0.18 of a cent, a cost so low as to be quite impressive. Certainly no hydroelectric system could compete with it.

If, however, instead of using oil, we had used lignites at 9000 B.t.u. per pound and costing \$2.50 per ton, such as is obtained in this vicinity, at only 60% combined efficiency of the boiler furnace and grate, we would get .076 of a cent as

the fuel cost per h.p.-hr. At one cent per h.p.-hr. our surplus horsepower, 200 h.p.-hr., would pay two-thirds of our fuel bill. Using the same price for oil the cost per thousand pounds of steam is approximately 43 cents. With lignite, the cost per thousand pounds of steam is 28 cents. Allowing for attendance, the cost is 50 cents and 35 cents, respectively.

If we take 40 cents per 1000 lbs. as the value of the exhaust steam and one cent per h.p.-hr. as the value of the power, then the power per thousand pounds of steam, 44 h.p.-hr., is worth 44 cents and the corresponding total value of the steam is 84 cents per 1000 lbs. generated.

Importance of Power By-Product —

In other words, even at such a low rate, the by-product power is worth more than the heat, the main product, although it takes only one-tenth of the energy. In the case of fuel oil, the heat is sold at a loss and yet the plant pays enormously. While in the above we have simply allowed so much for attendance, fixed charges, etc., yet in an exact calculation which should be carried out in every individual case, they will be found closely approximate.

In view of the above costs, you can readily see if it were proposed to shut down a plant in one of the large office buildings here, and purchase power and heat at the above prices, how great a loss it would be. Or if it were proposed to generate only heat and purchase the power, it would be quite as foolish. For the most profitable item, by-product power, is practically thrown away. It is like paving a street with gold-bearing quartz running forty a ton free milling without removing the gold. Yet this very thing is being done in hundreds of places.

Where such essential matters as proper construction are overlooked, or when the system is incomplete as when by-product is not produced, a district system would possibly make unwarranted, though not undeserved headway. It would of course be very good if it were possible for the engineers to have a board to investigate new systems as they were designed and report on them.

Helps at the Peak —

One of the very desirable features of by-product power is that it is produced during the day and peak of power demand, the heaviest periods. Another feature that must not be overlooked is that very little transmission is needed. The by-product power produced in the residence districts will have to be transmitted a longer average distance, but as a whole it will be very little because it is all produced within the city.

A PAPER MILL INSTALLATION IN THE NORTHWEST

(Electrical equipment as applied to the manufacture of paper has an interesting example in the plant of the Cascade Paper Company of Tacoma, Wash. Here is a description of the installations and the processes in which they are used.—The Editor.)

The Cascade Paper Company of Tacoma, Washington, has placed in operation a paper plant with a capacity of 20 tons of paper every twenty-four hours. The plant is located on Chambers Creek near Steilacoom, about six miles from Tacoma, fronting on Puget Sound. A reinforced concrete dam terraced on the lower side has been constructed across Chambers creek to provide a water supply for factory use.

Motor installations represent a load of over 600

horsepower from the lines of the local municipal system and are all belt-connected to the different machines. There are 16 motors in use. Eight of these have a combined capacity of 575 horsepower operating at 220 volts. The other eight motors have a combined capacity of 107½ horsepower running at 440 volts.

The two 300 kva. transformers receive energy at 50,000 volts and take it to the main seven-panel switchboard of the mill at 2200 volt, three phase. All this 2200-volt current is carried by three-conductor, lead-covered cable, leading from the oil switches through wood pipe to the main distributing panels in the south wing where connection is made to the 2200-volt motors in the various mill departments. Twenty-two hundred volt energy is carried by other cables to three 50 kva. transformers by means of which it is stepped down to 440 volts for the other motors, and one 50 kva. transformer for furnishing power at 220/110 volts for lighting.

Starting on the top floor of the north wing where the waste paper is made ready for the processes, there is a 40-horsepower 440-volt motor driving a high-speed shredder. Through the medium of other belt and pulley transmission, a mechanical cleaner and fan duster are driven at slow speed. Following these is an agitator and mixer, which is operated by means of a 15-horsepower motor.

The succeeding step in the process is witnessed on the floor below. Here a 75-horsepower 2200-volt motor drives a set of mixing rolls in each one of two steam cookers. In this instance the motor is belted to the two sets of rolls from a pulley on each end of the motor shaft. By the gravity process the pulp is passed from the cookers to tanks having within them mechanical agitators, operated at slow speed by a 75-horsepower motor. Pulp is raised by suction pumps to a screen, the material after being screened passing to two sets of washing rolls which are driven at 80 r.p.m. by a 75-horsepower motor. In bleached condition the product passes through the heater process. The four heaters are run at 80 r.p.m., driven by two 75-horsepower motors. The final reduction to a pulp of extreme fineness is carried out in Jordan machines operated by a 100-horsepower motor. The somewhat viscous partially fluid mass, after passing two sets of motor-driven screening devices is then started through the automatic processes of the steam-operated paper-making machine which is the last step in turning out the finished product.

Steam being necessary for cooking the pulp and keeping it at the right temperature in the various processes, a steam plant was constructed and equipped. Steam is used in operating the paper machine on account, in part, of the flexibility given in the matter of speed regulation.

Even temperature is maintained in the building by means of two motor-driven Cyclone fans forcing hot air through ducts to all the floors and different compartments.

The entire electrical equipment and fixtures were supplied by the Westinghouse Electric & Manufacturing Company and installations made under direction of E. J. Barry, electrical engineer, Tacoma.

The Business Library

BY LOUISE B. KRAUSE

(The greatest source of needed information for the engineer or the public utility man is in the government documents—provided he knows how to use them. Here is an article by the business librarian of H. S. Byllesby & Co., Chicago, which tells what information is available, where to look for it and how to obtain the pamphlets. Nothing more valuable has appeared thus far in this business library series. Attention is called to the fact that these articles are copyrighted. —The Editor)

GOVERNMENT DOCUMENTS AND THE BUSINESS LIBRARY

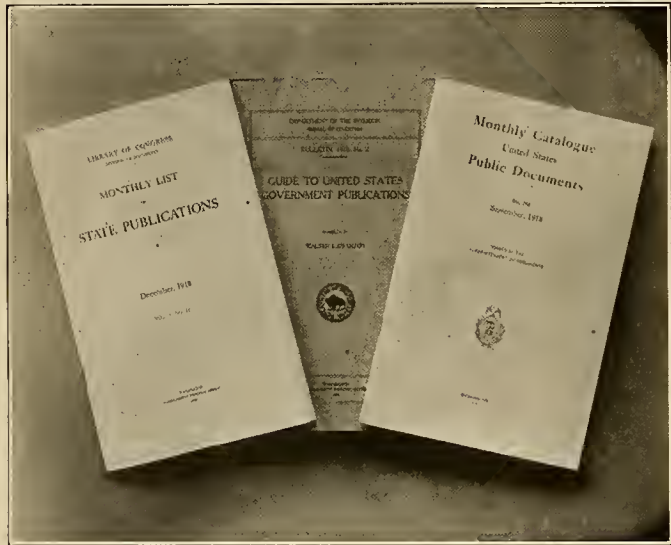
The United States Government is the leading publisher of accurate and reliable information bearing upon all kinds of business activities. No question should ever be investigated or data collected by a business firm without taking into consideration the valuable sources of government information. The "Yourovetia Review," March, 1919, says:

"It is not only safety and accuracy in the performance of its regular duties, but also expansion and development at which a progressive firm is aiming; and this can be attained only when the business is analyzed from all aspects of practical interest, when the horizon is being constantly searched, and endeavors are made to explore new commercial avenues."

Studies of mineral, oil and gas deposits, tests of boiler and furnace efficiencies, analyses and tests of

Foreign Countries; A List of Books on Foreign Countries.

Many practical illustrations could be given, if space permitted, of the use made by business firms of government publications. For example, a large mail order house made a decision, based on consulting the Weather Bureau's temperature records in the different sections of the country for a range of years, as to what date would be best for sending out, to various districts, advance catalogs advertising



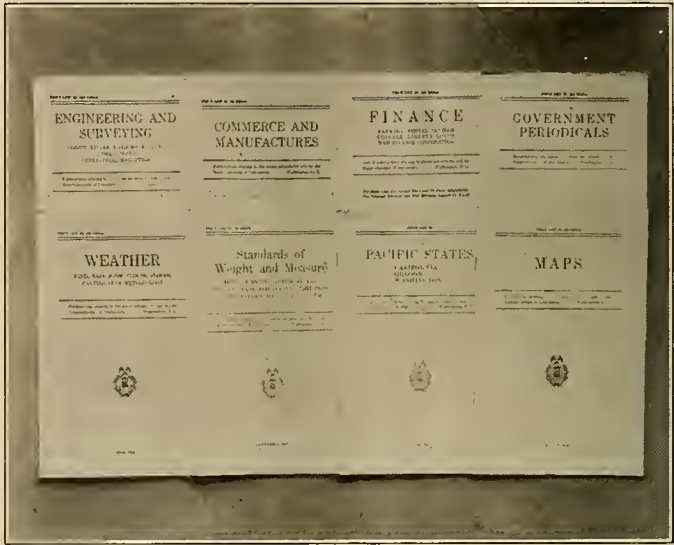
The "Guide to United States Government Publications" is invaluable to the man who wants to know where to find his object. A monthly catalog of current publications may be subscribed for by the year. State documents are listed by the Library of Congress in convenient reference form.

fuels, production of crops and cattle, labor problems, electrolysis, standards for gas and electric service, foreign trade, water power, and statistics of all industrial activities, constitute a few of the subjects on which the government periodically reports.

The daily paper called "Commerce Reports," which gives reports and business tips on trade and industrial conditions, gathered by American Consular officers at their respective posts throughout the world, is an invaluable periodical for business men.

The United States Shipping Board has issued a valuable series of free pamphlets in the interest of export trade, some of which are:

- World Trade; A List of Books on World Trade.
- Selection of Books on Foreign Languages.
- Ships and the Ocean; A List of Books on Ships, Commerce and The Merchant Marine.



The Superintendent of Documents issues free of charge, forty-four lists of the documents for sale by his office. These are listed under their general subject heading as indicated in the eight here shown.

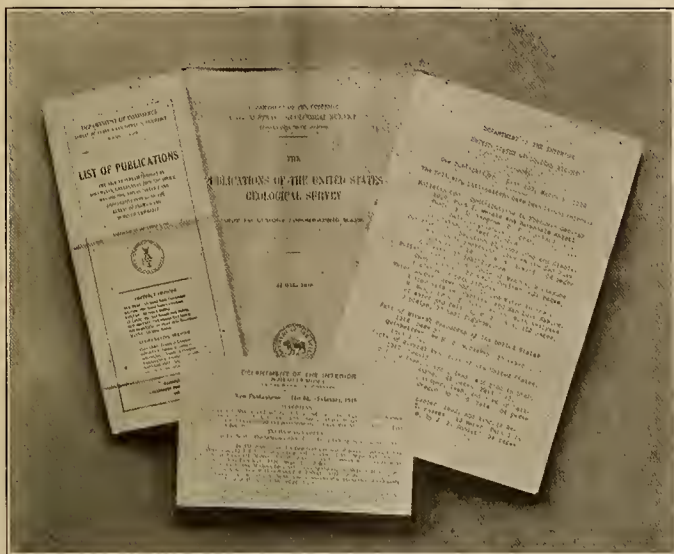
summer and winter wearing apparel; while an engineering firm, designing a gas holder to be erected in a northern city, decided on the factor of safety to be adopted against the lowest possible temperature, by consulting the weather reports for the lowest temperatures which prevailed in that section.

How to Procure Government Documents

To keep thoroughly informed on the large body of constantly growing data issued by the government, to know how to procure it without delay and apply it to a specific problem, is no small accomplishment, and this is one of the important reasons why the business man needs the assistance of a trained library worker. The average business man gets mentally lost in the thick woods of government documents; he either does not know which department or bureau of the government can give the specific information he desires, or how to procure the desired data in the shortest possible time.

The best way for the business man to find out what information is in print and can be procured for his personal use, is to write direct to each department, or special bureau, for the catalog of their

available publications. For example, the Bureau of Foreign and Domestic Commerce issues a catalog of Bureau publications which is described as a "review of information available to manufacturers and exporters in the bulletins issued by the Bureau." The Navy Department issues an "Index to Specifications for Naval Stores and Material" which is very useful to many classes of business men who are drawing up specifications for the purchase of various kinds of material. The list of publications of the United States Geological Survey is a most valuable guide in procuring bulletins on water power and irrigation,



The various bureaus issue periodical bulletins on the current publications under their supervision. These may usually be had for the asking

mines and mineral resources, as well as important papers on economic geology, namely, oil, gas, and other useful minerals. The United States Bureau of Standards, the Bureau of Census, the Bureau of Mines, all publish catalogs of papers issued by them, which are of the greatest possible value to business men. These bureaus, in addition to their printed catalogs, issue supplemental lists of new publications each month and the "Monthly Catalog of United States Public Documents," issued monthly, price \$1.10 per year, obtainable from the Superintendent of Documents, also gives a list of all current publications of all departments of the government.

The Superintendent of Documents issues free of charge, forty-four lists of documents, for sale by his office, on certain subjects, such as Roads, Labor, Foreign Relations of the United States, Finance, Transportation, etc. A complete list of these subjects can be found in Swanton's Guide to United States Government Publications (Bureau of Education Bulletin 1918, No. 2), page 127, obtainable from Superintendent of Documents at twenty cents per copy. This guide is a most useful compilation as it describes briefly the work of each department of the government and the kind of publications issued by them, stating where they can be obtained and what classes of publications are free and what are for sale.

Government publications which ordinarily may be obtained free by applying direct to the Bureau issuing them, if out of stock may often be bought from the Superintendent of Documents. The Super-

intendent of Documents requires that all publications ordered from him be paid for in advance, and this involves some difficulty, as often a man does not know how much money to send to procure the publication, if he has not seen the price quoted. Some business libraries, to save delay in ordering, deposit twenty-five dollars in advance with the Superintendent of Documents against which the cost of documents ordered can be charged. The old idea of procuring publications through a Congressman or Senator is the poorest kind of method of obtaining what is wanted in a hurry, for many government documents will not cost the business firm anything and the others cost a very small price.

Some of the departments of the government issue advance mimeographed sheets of information and will also give out, in advance of printing, data on file in the department to firms which make special request for it, and have also been known to reply promptly to telegraphic requests.

Some of the bureaus of the government have district offices in a few of the large cities of the United States, for example, district offices of the Bureau of Foreign and Domestic Commerce, Weather Bureau, etc., which are of great service in obtaining data in a hurry, and the business man should ascertain the resources of his city in this respect. He also should not forget to use the collection of government documents at his Public Library when he wants to use publications of which he cannot obtain a copy for his own immediate needs. Some of the smaller public libraries do not have their government documents fully cataloged and immediately available so that the business man must not infer, because he cannot find certain government information at his public library, that it does not exist.

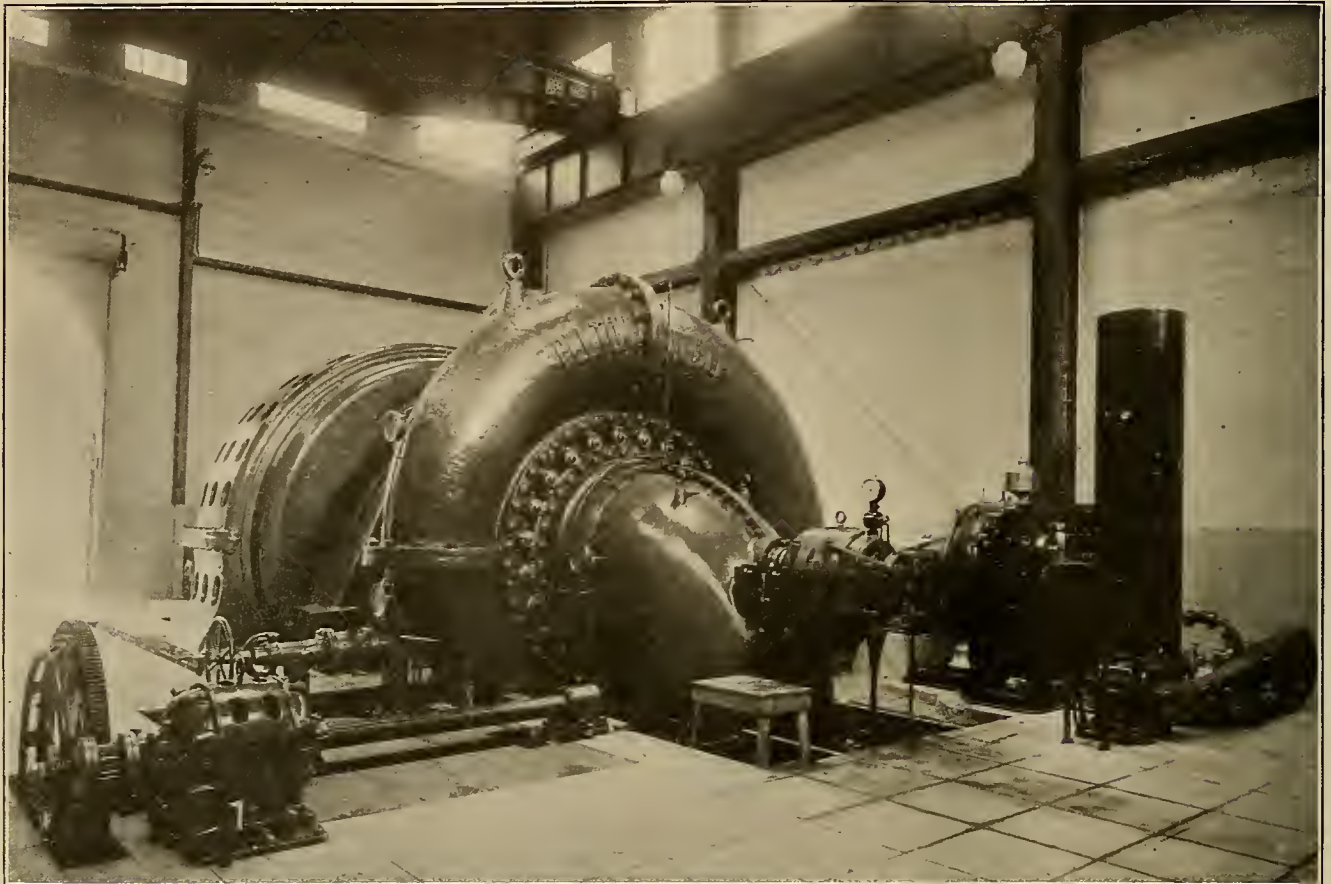
State Documents

The individual states of the United States also publish valuable documents through their state boards and commissions with which it is well for the business man to be acquainted. Many of the individual states have similar boards and commissions which report annually or biennially, both in bulletins and regular reports, such as state engineer, state geologist, state mining department, state insurance department, state experiment station, bureau of labor and industrial statistics, state public utilities commissions and special commissions created to deal with any particular problems or industries, peculiar to the individual state. The best guide available to current state publications is the "Monthly List of State Publications" published by the Library of Congress, fifty cents per year. The chief drawback in the use of this list is that it is always several months behind in being published, as is also the "Monthly Catalog of United States Public Documents." The current trade periodicals often note the issue of any important state publications more promptly and are a great aid in keeping up to date on this information. Public Affairs Information Service, a cumulated index published by H. W. Wilson Company, New York City, and which will be noted more fully in a subsequent article on Reference Books, lists a number of state publications of value.

PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(The fundamental principles of electricity as it is used in the electrical apparatus you are handling, are set forth in this course on practical electricity in which the Journal of Electricity is cooperating with the extension departments of the Universities of California and Oregon. This is the sixth article of a series of fifteen. It is still possible to enter the course however—and back numbers will be furnished to all enrolling late.—The Editor)



The Wise power plant of the Pacific Gas & Electric Co. contains the largest single discharge turbine in the world, with a possible horsepower of 20,000. Its efficiency is 87%. Behind it you see an enormous a. c. generator with revolving field. Its efficiency is 96%. What is the input to the turbine in "hydraulic horse power" when the generator gives out 12,000 kw.?

THE GENERATOR

Faraday's Discovery.—As shown by the electromagnet, an electric current can produce magnetism; it was to be expected that electric current could be produced from a magnet. After many fruitless efforts Faraday in 1831 discovered how to do it; with the arrangement shown in Fig. 1 he succeeded in causing a flow of current through the sensitive ammeter whenever he moved the magnet into or out of the coil. The current stopped as soon as the movement stopped; leaving the magnet in the coil produced no current. But moving the coil off the magnet while the latter was held still caused the current to flow just as if the magnet itself had moved.

The effects produced by moving the magnet or the coil may be said to be caused by the cutting of the wires by lines of force. As soon as the cutting stops, the circuit is dead. The current through the ammeter depends upon the resistance of the connecting wires as well as upon the motion of the magnet;

so it is better to replace the ammeter by a voltmeter and make further investigations of the phenomenon on the basis of electromotive force.

This e.m.f. is said to be "induced" by the magnetic lines, just as pieces of iron acquire "induced magnetism" in the neighborhood of a magnet.

Experiments with coils of various numbers of turns, with magnets moving slowly and rapidly, and with magnets of different strengths, lead to this conclusion: The induced e.m.f. depends upon the number of lines of force, the speed with which they cut the wire, and the number of turns of wire in series. (A strong magnet has, of course, more lines of force than a weak one.) It was found possible to get a definite numerical statement, as will be explained later in connection with the voltage of generators.

Faraday's apparatus always produced an alternating voltage; pulling out the magnet induced an e.m.f. opposite to that caused by putting it in. Inserting the S pole induced a voltage opposite to

that caused by inserting the N pole. The only way to get a current through the ammeter of Fig. 1 continuously in the same direction is to reverse the connections with every movement of the magnet.

The A.C. Generator.—On account of the mechanical advantages of rotary over reciprocating motion, generators are built commercially with either the magnets or the coils revolving. Fig. 2 gives a general idea of the arrangement of a "revolving field" alternator. We have here a magnet turning on a shaft so that the lines of force close to its poles cut

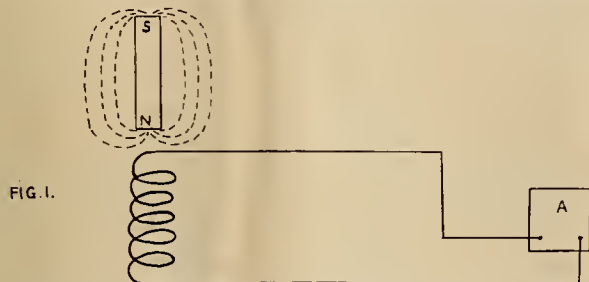


Fig. 1.—The details of Faraday's arrangement for causing a flow of current through an ammeter by moving the magnet in and out of the coil

across the stationary wires A and B. The N pole induces in wire A a voltage directed toward the back of the machine, while in B the S pole sets up an e.m.f. in the forward direction. The wires are joined at the rear and connected to a lamp in front, which at the instant shown has current flowing in it from right to left. When the poles are turned far enough to exchange places, the electromotive force is again induced but in the opposite direction, so

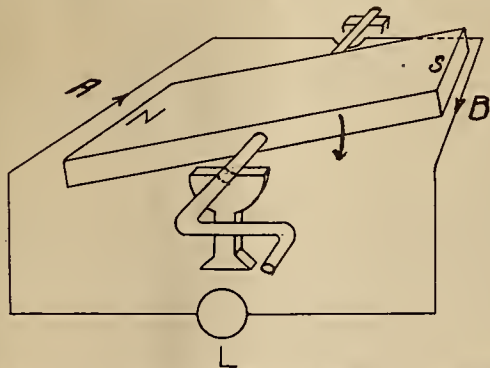
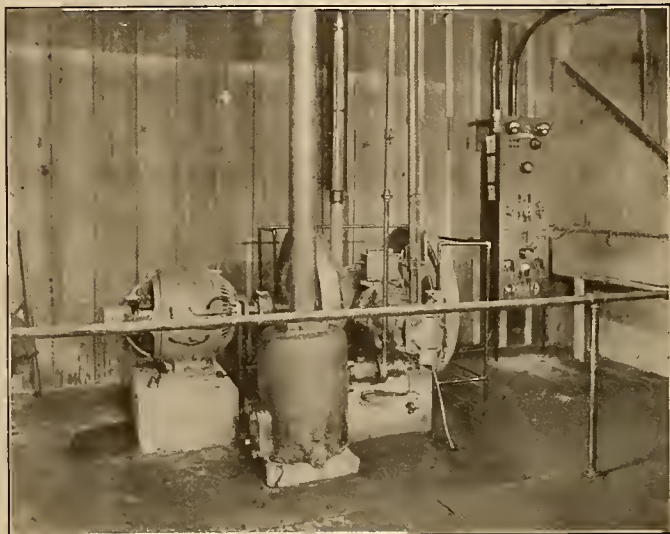


Fig. 2.—The plan of the "revolving field" alternator. At the instant shown the lamp has current in it from right to left

that the current flows from left to right in the lamp, having stopped when the magnet was halfway between the two positions. Thus is produced an alternating current, which might be "rectified" so as to flow always in the same direction through the lamp by reversing the lamp connections twice in each revolution of the magnet.

The "revolving field" usually contains, instead of a single permanent magnet, a number of strong electromagnets. An iron ring is placed around the outside of the "inductors" (wires cut by the lines of force) so that the flux may get from pole to pole with as little difficulty as possible. Thus there is provided a large number of lines of force, and by turning the shaft rapidly it is possible to induce several volts in one inductor. Finally, a number of wires are connected in series, so that the generator produces any voltage desired.

The D.C. Generator.—A revolving field machine is not well adapted for producing direct currents. The d.c. generator in Fig. 3 has therefore a stationary field and revolving "armature." (The armature is the structure which includes the inductors and



In a Columbia River salmon cannery this 6 kw., 120 volt d. c. generator produces all the current necessary to operate the lights and motors. It is driven by a 10 h. p. semi-Diesel oil engine. What is the efficiency of the generator and what current does it supply when fully loaded? How many pounds of oil are used in 8 hours if the average load is 40 amperes, the engine efficiency is 30% and the fuel gives 19000 B. T. U. per lb.?

the iron core to which they are attached; the core is omitted from Fig. 3 for the sake of clearness.)

With this simple arrangement the voltage drops to zero twice in every revolution. If a second coil

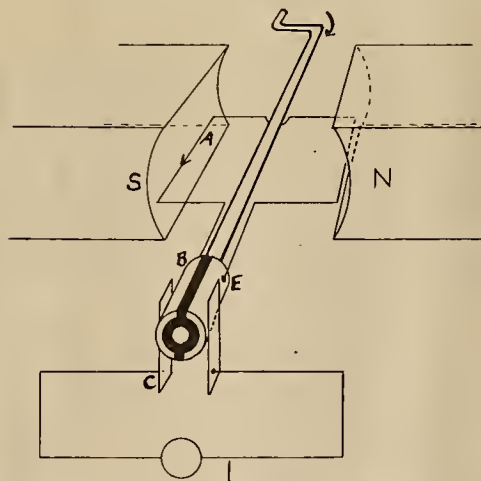


Fig. 3.—A d. c. generator with a stationary field and revolving armature for producing a direct current. In the position shown the wire A has induced in it a voltage directed forward, which drives current out of the armature through the sliding contact between a "segment" (B) and a brush (C). The segment B is attached to the armature and revolves with it, so that when A reaches a position close to the N pole it is in contact with the other brush, and segment E has come around to brush C. Thus the wire passing the S pole always sends current out to brush C, and so downward through the lamp, L.

were put on the armature at right angles to the first coil, it would have a strong e.m.f. when the first e.m.f. is zero. With the ring split into four parts instead of two, and the new coil connected to two of the segments, a fairly uniform pressure could be produced. In practice many coils are used on the armature and correspondingly many segments are built into the "commutator" as the split-ring device is called.

It should be clear that a d.c. generator produces an alternating current which is "rectified" or made into direct current by means of the commutator. Many d.c. machines are made with more than two poles; in these there are usually as many brushes as poles. Carbon is the material used in the brushes, chiefly because of its resistance which is useful in limiting the short circuit currents which tend to flow from one "bar" (segment) of the commutator to the next while the brush is touching both.

Generator Voltage.—It is customary to specify the strength of the magnets used in generators by the number of lines of force they produce. This system is, of course, based on an arbitrary standard, for a line of force is merely a convenient term to use in connection with magnets and it has no tangible existence. In practice the electromagnets most used have from 100,000 to several million lines issuing from their N poles. It is to be noted that one inductor cuts across all these lines once when passing the N pole of a magnet and again when passing the S pole, so that the total number of cuttings during one revolution equals the product of the number of poles times the lines per pole.

The standards of pole strength and electromotive force have been so selected that one volt is the e.m.f. induced by cutting one wire in one second by 100,000,000 lines of force. Putting inductors in series adds their voltages, so that

Generator Voltage = No. Poles Passed per
Second × Flux per Pole × No. Wires in
Series ÷ 100,000,000.

This formula gives the average voltage for an alternating or fluctuating current, or the steady voltage in a d.c. machine. The number of wires in series may be the total number of inductors on the armature, or one-half that number, or one-fourth or one-sixth, or less. Direct current generators usually have enough coils and commutator segments to make the voltage practically constant at the value given by the formula.

THE PRODUCTION OF ELECTRIC POWER FOR
FEBRUARY, 1919

PREPARED BY W. B. HEROY

THOUSANDS OF KILOWATT-HOURS PRODUCED

State	By water- power	By fuels	State	By water- power	By fuels
Alabama	39,372	12,939	Nebraska	810	16,022
Arizona	3,967	16,395	Nevada	2,913	137
Arkansas	77	6,275	New Hampshire	4,660	2,188
California	190,462	38,295	New Jersey	165	79,153
Colorado	13,161	17,271	New Mexico	59	1,272
Connecticut	12,419	38,643	New York	204,590	288,986
Delaware	0	5,549	North Carolina	43,234	2,820
Dist. of Columbia	0	18,094	North Dakota	0	2,308
Florida	678	11,257	Ohio	2,309	181,766
Georgia	35,497	7,236	Oklahoma	223	12,092
Idaho	42,050	259	Oregon	27,034	3,259
Illinois	13,701	241,930	Pennsylvania	55,066	243,098
Indiana	3,761	56,151	Rhode Island	383	28,767
Iowa	44,214	23,110	South Carolina	64,745	3,235
Kansas	1,267	29,203	South Dakota	4,624	3,751
Kentucky	4	18,900	Tennessee	43,780	8,368
Louisiana	0	14,034	Texas	165	43,151
Maine	16,611	132	Utah	48,906	0
Maryland	278	18,448	Vermont	13,777	209
Massachusetts	19,147	102,844	Virginia	17,693	17,685
Michigan	49,980	97,187	Washington	71,160	5,667
Minnesota	24,525	28,708	West Virginia	1,453	51,584
Mississippi	0	5,789	Wisconsin	28,284	32,709
Missouri	4,297	37,212	Wyoming	251	3,542
Montana	69,220	1,552			
Total				1,220,972	1,879,182
Combined total					3,100,154

This report is based on returns received from 3,150 electric power plants engaged in public service, including central stations, electric railways and certain other plants, the output of which contributes to the public supply. The returns received represent about 85 per cent of the total generating capacity. For plants which did not make returns or which were unable to furnish the data requested, estimates of output were made from available information. The output for the month averages 110,000,000 kw-hr. per day, of which 39 per cent was produced by water power.

The total capacity of electric power plants represented in the above report is as follows:

State	Capacity (kilowatts)	State	Capacity (kilowatts)
Alabama	165,688	Montana	237,476
Arizona	91,363	Nebraska	90,462
Arkansas	32,358	Nevada	10,630
California	852,966	New Hampshire	47,938
Colorado	131,027	New Jersey	343,214
Connecticut	252,130	New Mexico	12,830
Delaware	20,617	New York	1,836,029
Dist. of Columbia	66,450	North Carolina	172,217
Florida	69,304	North Dakota	20,939
Georgia	214,250	Ohio	829,161
Idaho	115,439	Oklahoma	68,013
Illinois	804,329	Oregon	112,008
Indiana	319,348	Pennsylvania	1,132,174
Iowa	291,635	Rhode Island	159,176
Kansas	156,114	South Carolina	195,192
Kentucky	104,889	South Dakota	34,449
Louisiana	52,639	Tennessee	170,272
Maine	92,927	Texas	202,101
Maryland	123,879	Utah	76,832
Massachusetts	748,698	Vermont	86,071
Michigan	476,913	Virginia	186,150
Minnesota	292,935	Washington	275,802
Mississippi	34,315	West Virginia	187,556
Missouri	291,170	Wisconsin	351,215
		Wyoming	21,031
Total			12,665,309

The production of the electric power reported required the combustion of fuels in the quantities indicated in the following table:

State	Short tons Coal,	Petroleum and Derivatives, Barrels	Natural Gas, Thousands of cubic feet
Alabama	30,164	0	0
Arizona	483	109,450	0
Arkansas	13,267	442	0
California	0	199,074	0
Colorado	40,980	1,896	0
Connecticut	61,745	333	20,766
Delaware	8,590	0	0
Dist. of Columbia	21,418	0	0
Florida	3,424	25,084	98
Georgia	14,088	120	0
Idaho	125	10	0
Illinois	360,806	1,004	0
Indiana	152,218	436	2,160
Iowa	136,896	798	0
Kansas	46,987	40,543	67,937
Kentucky	41,636	381	0
Louisiana	14,240	30,788	55,092
Maine	525	7	0
Maryland	28,317	159	1,500
Massachusetts	133,965	21	0
Michigan	127,362	117	0
Minnesota	64,400	1,003	0
Mississippi	16,177	410	0
Missouri	84,472	32,198	0
Montana	5,008	539	1,008
Nebraska	29,237	5,488	0
Nevada	198	900	0
New Hampshire	5,205	20	0
New Jersey	107,035	95	121,000
New Mexico	2,876	1,060	0
New York	367,508	380	458,233
North Carolina	8,456	20	0
North Dakota	15,875	547	0
Ohio	313,309	786	271,454
Oklahoma	10,705	8,140	377,988
Oregon	139	14,716	0
Pennsylvania	443,892	15	53,045
Rhode Island	29,692	0	0
South Carolina	8,971	62	0
South Dakota	12,653	3,321	0
Tennessee	24,161	61	0
Texas	25,800	171,374	173,960
Utah	0	0	0
Vermont	642	0	0
Virginia	30,503	132	0
Washington	23,381	1,989	0
West Virginia	61,120	7	86,276
Wisconsin	65,901	584	0
Wyoming	13,264	8,260	2,884
Total	3,007,815	662,770	1,693,401

SPARKS—Current Facts, Figures and Fancy

(Volcanoes, wireless telephone systems, safety-razors and Russian paper money have no particular connection with each other, but variety is the spice of life. We do not aim to make this page an encyclopedia, but in case you are consumed with a desire to know how many inhabitants Europe has, how much Japan makes out of tourists, and the amount of electric energy generated in the United States, we give it all here.—The Editor.)

The greatest hydroelectric plant in the world is being planned for India. It is expected to deliver water to the turbines at a pressure of 680 pounds to the square inch.

* * *

Italy has harnessed a volcano to a 15,000 h.p. electric power house, using the heat to generate steam. Perhaps San Francisco will ultimately find a use for earthquakes.

* * *

Some one has invented a safety razor which has a tiny electric lamp mounted in the handle. Commuting under the daylight-saving bill is evidently the source of this inspiration.

* * *

Europe is the most densely populated of the world's continents. It has 120 inhabitants per square mile, and from 1818 to 1918 the population increased from 150,000,000 to 460,000,000.

* * *

A new writing pad has a dry battery electric lamp mounted under the paper, making it possible for letters to be written in the dark. This ought to have a large sale in boarding schools and army camps.

* * *

Electrification of railways is going ahead in Japan. A few years ago the electric line between Tokyo and Yokohama started operations, and plans are now under way for the electrification of the railway between Yokohama and Yokosuka.

* * *

Russia is running short of paper and will be obliged to restrict her prolific output of paper money. If, as is said, the 40 rouble note is now but little larger than a postage stamp, it is to be hoped that the necessary restrictions will apply to quantity and not to size.

* * *

Japan makes more out of tourists than she does out of coal exports, and in view of the fact that her 1918 coal exports were worth some \$13,000,000, this is no insignificant item. During 1918 the discomfords of war sent about 3,000 visitors to Japan from Russia alone, in addition to large numbers of French and Dutch.

* * *

It is reported by way of Copenhagen that during January, 1919, Germany trans-shipped over Denmark and Sweden about twenty-seven million dollars' worth of merchandise of various kinds. These fig-

ures are rather remarkable as illustrating the industrial activity which Germany has been able to maintain in spite of the war.

* * *

During the war an unusually large number of Japanese students studied in America. Now, according to the Japanese Department of Education, they will be re-distributed, the art students going to France, the mechanical engineers to England, the medical students and those studying pure science to Germany as before, while the United States will receive those in applied science.

* * *

An interesting experiment is being tried out in Massachusetts in the form of compulsory voting. An amendment to the state constitution makes registration and the casting of a ballot compulsory for every eligible citizen, and failure to do so punishable by fine. Making civic indifference expensive is a possible way of abolishing it, and the idea might be tried out more widely with good effect.

* * *

A world-wide wireless telephone system was a project outlined in New York by Ernst F. W. Alexanderson, consulting engineer of the General Electric Company. He claims that with the aid of two devices invented by him—the bridge receiver and the barrage receiver—it is possible to operate this system on the same plan as the ordinary telephone, central offices being established in all the principal cities.

* * *

A rapid development of the electrical industry is indicated in the report of the census bureau. In 1917 more than twenty-five billion kilowatt hours of electric energy was produced and distributed by electric central station. These employed more than 100,000 persons and paid annual salaries and wages amounting to \$100,000,000. The output for 1917 was more than double the output in 1912 and more than quadruple that for 1907.

* * *

The question of port-owned ships is one which is now occupying some western coast towns. If ships are bought by the Port Commission and operated on behalf of the city the private enterprises would be deterred from competition, and the city would be under the necessity of maintaining an expensive shipbuilding program to keep pace with increasing requirements. If the shipping is left to private concerns, on the other hand, the city may not get sufficient ships for its needs.

PERSONALS

Donald C. Barnes, manager of the traction and power properties in the city of Everett, Washington, has been appointed manager of the Seattle division of the Puget Sound Traction Light & Power Company, to succeed A. L. Kempster, recently resigned and now in New York. Mr. Barnes is well known in utility circles, having been associated with the Stone & Webster management since 1905. During the past few years he has been manager at Everett of the Puget Sound International Railway and Power Company and the



Pacific Northwest Traction Company, in charge of city railway, light and power operation and of the Seattle-Everett Interurban lines. It is confidently believed that Mr. Barnes' well-known business ability, combined with his broad ideals of service to the public, will have a far-reaching effect in forwarding to still higher planes of usefulness the method electrical in the great Northwest.

Fred W. Fischer, a well known contractor-dealer from Denver, Colo., has been a recent San Francisco visitor.

E. W. Johnson, sales manager of the American Chain Company of Portland, is a recent visitor in San Francisco.

C. F. Henderson, Call Building, San Francisco, has been appointed representative of the Jewell Electrical Instrument Company of Chicago.

Edward Bell Field, Jr., of Denver, Colo., vice-president of the Mountain States Telephone & Telegraph Company, spent a few days in San Francisco recently.

B. F. Jakobsen, consulting engineer of San Francisco, has taken the position of Chief Designing Engineer for the San Joaquin Light & Power Corporation of Fresno, Cal.

W. G. Vincent, valuation engineer of the Pacific Gas & Electric Company, is the recently elected incoming chairman of the San Francisco Section, A. I. E. E. The section looks forward to a successful year under his able guidance.

Roy Worth, credit manager for the Pacific States Electric Company of Seattle, is spending two weeks in the East, the main object being attendance at the Shriners' convention in Indianapolis.

C. W. Price of Chicago, general manager of the National Safety Council, was a recent visitor in Portland, Ore., where he delivered two addresses on accident prevention before industrial gatherings.

Colonel H. H. Arnold, former commander of Rockwell Aviation Field, San Diego, recently arrived in San Francisco, having been appointed department aviation officer at Western Department headquarters.

Alfred A. Winslow, Consul-General at Auckland, New Zealand, is a visitor in San Francisco, where he will hold conferences with importers and exporters who are interested in trade with New Zealand.

H. D. Hawks, general sales manager of the Rolling Mills department of the Anaconda Copper Mining Company of Great Falls, Montana, has transferred his headquarters from Montana to the company's office in Chicago.

V. D. Harrison, purchasing agent of the Seattle office, Pacific States Electric Company, has returned from a two weeks' visit to the head offices at San Francisco. On the

return trip he stopped off and spent two days at the Portland offices.

Percy S. Martin, active in the Seattle electrical field, has purchased an interest in the Standard Electric Company and is to have charge of the electrical repair shops of the company, as well as handle a portion of the construction work.

E. P. Waller, assistant general manager of the Railway Department of the General Electric Company, Schenectady, N. Y., and F. H. Babcock and E. F. Brown of the Lighting Department of the same company, recently spent some time in San Francisco.

Lieutenant-Colonel Chas. M. Black, member of the firm of Ford, Bacon & Davis, consulting engineers, is a San Francisco visitor who will remain away from his New York office until after the Bohemian High Jinks takes place in Marin county, California.

Burton R. Stare of the Burton R. Stare Company, and president of the Pacific Lamp & Supply Company, Seattle, is attending the Shriners' convention at Indianapolis. While away he will visit several other eastern cities on business, including St. Louis, Chicago and Cleveland.

W. L. Thompson of Thompson & Castleton, electrical engineers and contractors of Seattle, Wash., has returned from a trip to the Ochoco irrigation project in central Oregon where he superintended the installation and starting up of two 12-inch pumps for the sluicing work in connection with the dam.

F. H. Murphy, illuminating engineer of the Portland Railway Light & Power Company, F. C. Knapp, president of the Peninsula Shipbuilding Company, and V. H. Haybarker, electrician of Portland, have been appointed members of the new state commission to regulate and supervise lighting systems in industrial plants.

M. G. Meische has resigned as superintendent of transportation of the Rainier Valley electric lines at Seattle to enter private business. T. H. Nolan, chief inspector, will have charge of the office until Mr. Meische's successor is appointed. Mr. Meische has been with the Rainier Valley lines for ten years and has been superintendent of transportation since 1916.

E. A. Weymouth has resigned from the Pacific Gas & Electric Company to enter the employ of the Remar Company as sales manager. Mr. Weymouth had been with the Pacific Gas & Electric Company since 1911, as acting manager in the Marysville district, as assistant manager of the Sacramento district, and recently at the head offices in San Francisco. He took an active part in the Pacific Service Employees' Association, acting as chairman of the Education Committee and later of the Welfare Committee.

D. J. Butts has resigned his position as Pacific District Specialist with the Western Electric Company, with head-

quarters in San Francisco. It was sixteen years ago this month that he started to work for the Western Electric Company in the old Clinton street works. Hereafter he will be associated with Thomas Foulkes of Los Angeles, having purchased a half interest with Mr. Foulkes, and combining the interests of "Thomas Foulkes and Son" and the "Foulkes Electric Co., Inc." The new firm will do a general elec-



trical contracting business, operate a shop for the manufacture of special panel boards and boxes, as well as carry on the retail electric store. The firm address for the present will be 603 South Figueroa street, Los Angeles.

Major George F. Sever, Engineer U. S. A., has been honorably discharged from the United States Army after a service of fifteen months and will make his headquarters in New York City for consulting engineer practice. Major Sever during his service made extensive and detailed investigations of the electric power conditions in New England, as well as on the Pacific Coast from Seattle to Los Angeles. His investigations covered careful analyses of the production of power by coal, oil and water, and the comparisons of these different methods. All well wish-

ers of the West will recall the able work Major Sever performed on the Pacific Coast during the trying period of the war.

David T. Day of the Bureau of Mines, Washington, D. C., is a recent visitor to San Francisco.

W. L. Grut, agent for the General Electric Company at Bangkok, Siam, was a recent San Francisco visitor.

Lieut. Paul Griffin, formerly of San Francisco, recently spent a short time there on his way to Siberia, where he will join the A. E. F.

G. Chester Brown has been appointed Chief Mine Inspector under the Industrial Accident Commission of California, to succeed H. M. Wolfiin.

D. I. Cone, of the electrical engineering staff of the Pacific Telephone & Telegraph Company with headquarters in San Francisco, is at Vancouver, B. C.

A. H. Babcock, electrical engineer for the Southern Pacific Railroad, is again at his San Francisco office after an absence of several weeks in the East.

F. G. Baum, consulting electrical engineer with headquarters in San Francisco, is at Fresno on special investigations for the San Joaquin Light & Power Corporation.

S. M. Kennedy, of Los Angeles, general agent of the Southern California Edison Company and well known to readers of the Journal of Electricity, visited San Francisco recently.

E. O. Shreve, San Francisco manager, and John Hood, industrial engineer for the General Electric Company, having spent four weeks visiting eastern business centers, are again in San Francisco.

E. Huguenin has been appointed field assistant of the California State Mining Bureau for the group of eight counties from Tehama north to the Oregon boundary. His headquarters will be at Redding.

W. J. Davis, Pacific Coast Engineer for the General Electric Company, is at his San Francisco office after an interesting business trip East. Mr. Davis returned West over the electrified railway, the Chicago, Milwaukee & St. Paul.

Mark L. Requa of San Francisco has resigned his position as director of the oil division of the United States Fuel Administration, and will resume his private business connections in California. He is expected to return to San Francisco at an early date.

Dean G. A. Covell of Oregon Agricultural College will represent the engineering interests of the Northwest in a public conference on business training for engineers and engineering training for students of business at Washington, D. C., June 23 and 24.

Robert Sibley, editor of the Journal of Electricity, is at Detroit, Michigan, attending a meeting of the nominating committee of five to name the incoming officers of the American Society of Mechanical Engineers. Mr. Sibley, by vote

of the Los Angeles and San Francisco Sections, represents the Pacific Coast at the Detroit conference.

Renzo Norsa, chief electrical engineer for the General Italian Edison Company of Milan, Italy, is a recent Pacific Coast visitor. During the war period Mr. Norsa was a Captain of Engineers in the Italian army. He is a member of the American Institute of Electrical Engineers and is now visiting practically all the larger power developments in the United States.

George L. Baker, Mayor of Portland, has been appointed a member of the board for investigation of electric railway problems by President Wilson. A wire announcing the appointment was received at the mayor's office recently. The board is to inquire into all problems of electric railways within the United States, including cost of operation, taxes, rates, and other matters.

Carl E. Heise, San Francisco district manager of the Westinghouse Electric & Manufacturing Company, was struck by lightning while on a recent visit to the Yosemite Valley. Reports have it that the stroke was a real honest-to-goodness stroke and had nothing to do with the approaching July "thirst." Anyway, Mr. Heise is again looking his old self, we are glad to report.

H. B. Kellam, chief draftsman of Pass & Seymour, Inc., with headquarters at Solvay, N. Y., is hoping to get located in Los Angeles or vicinity. Mr. Kellam has had fourteen years of practical all-around shop experience, such as tool making, designing and supervision, and it is hoped that any member of the industry knowing of a position open for a man of these qualifications will drop him a line.

Mortimer Fleishhacker, president of the Great Western Power Company, and George I. Cochran, vice-president of the Southern California Edison Company, have been appointed by Governor Stephens of California as two of the Regents of the University of California. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, composing the third utility representative on the Board, has already served the state in this capacity for sixteen years.

F. D. Baker, formerly with the commercial department of the Sierra & San Francisco Power Company with headquarters in San Francisco, has recently been promoted from Captain to the rank of Major. He has for the last year been doing important work as one of three officers who established a new accounting system in the purchase, storage and traffic division of the army. Major Baker is now located in the Munitions Building, Washington, D. C., but plans to make an inspection trip to the West shortly.

OBITUARY

Jesse W. Lilienthal, president of the United Railroads and one of the best known and most admired of San Francisco's prominent citizens,

died suddenly in San Francisco on June 4. Mr. Lilienthal was addressing a gathering at the St. Francis Hotel in connection with the drive on behalf of St. Ignatius College when he was stricken with apoplexy. He was sixty-four years of age, and apparently in good health; his sudden death came as a great shock to the community. Well known as a lawyer, business man and philanthropist, he

was connected with a wide variety of civic interests, and at the time of his death he was serving as general chairman of the San Francisco War Camp Community Service. The city loses in him a most active and respected citizen.



Meeting Notices for Electrical Men

(A number of important conventions are the outstanding features of the past two weeks. Reports from the Vancouver Convention of Contractors and Dealers show great activity in the Northwest while further news of the N. E. L. A. Atlantic City Convention points to vigorous plans for the future. The program for the coming Pacific Coast Convention A. I. E. E. promises to be one of the most exceptional of the year.—The Editor.)

Pacific Coast Convention, A. I. E. E.

The Pacific Coast convention of the American Institute of Electrical Engineers, scheduled for Sept. 18, 19 and 20 in Los Angeles, will be one of special importance and helpfulness, as the war has prevented the members from holding any convention of the kind for the past two years. The program is being arranged by Carl E. Johnson, manager of the U. S. Electrical Manufacturing Company of Los Angeles, and will include a number of notable papers by well-known experts. Only a preliminary announcement of these can be made at this time. Professor Harris J. Ryan of Stanford University will give some account of data collected by him during his recent extensive electrical research work. W. A. Lynn of the Mare Island Navy Yard will speak on the electric furnace and the extensive use of this type of electric load in the navy yard. F. A. Anderson, Electrical Inspector for the United States Shipping Board, will discuss electrical installations and wiring aboard ship, and new developments of the Emergency Fleet Corporation along this line.

A number of other papers on subjects of great scientific interest and technical value will be given. Representatives from all the Pacific Coast sections will be present and the gathering is expected to be one of the most successful and largely attended of its kind.

Electrical Contractor-Dealers Convention, Vancouver Association

A most important and successful electrical convention convened at headquarters in the Hotel Vancouver, B. C., Monday and Tuesday, May 26 and 27.

The general purpose of the big meeting was to have a wide open conference for electrical men, for which the names of all central stations, manufacturers and contractor-dealers west of Winnipeg were secured and an invitation extended for them to send delegates to the convention. The representation from the various sections in the territory covered was all that could be desired as shown by the marked spirit of cooperation of those present.

Among the prominent speakers were Samuel Adams Chase, special representative of the Westinghouse Electric & Manufacturing Company of Pittsburgh, who described a very optimistic outlook for the electrical industry and urged the cooperation of every man affiliated in any way with electrical interests of the country.

Wm. L. Goodwin, originator of the Goodwin Plan, spoke on "Ills of the Industry," demonstrating to a marked degree that certain minor functioning of some of the factors in the industry were frequently the direct cause of much avoidable

trouble. The manufacturer, jobber, central station and contractor-dealer each has his own distinctive work to do, and when one of these specific factors in the industry undertakes to fulfill the function of the other, trouble immediately begins.

Much credit is due to President E. Brettel and Secretary W. J. Conway for their untiring efforts toward making the convention the great success it turned out to be.

Engineers' Club of San Francisco

At a luncheon talk before the Engineers' Club of San Francisco on May 29th, E. S. Pridham and R. L. Jensen of the Magnavox Company, inventors of the wireless telephone transmitter used in aeroplanes on the western front gave a most excellent and interesting demonstration. The apparatus

was exhibited and the history of its invention recounted. The meeting was very well attended. Robert Sibley, editor of the Journal of Electricity, acted as Chairman of the Day.

San Francisco Development League

At a well-attended meeting of the San Francisco Electrical Development League held on May 26th, August Vollmer, Chief of Police of Berkeley, Cal., gave an interesting address on "The Detection of Crime." Mr. Vollmer maintains that neither severe punishment nor the offering of rewards are real deterrents of crime; they treat the effect, not the cause. Procedure in the case of criminals should be directed towards correcting the mental personality responsible for the crime.

Electrical Gathering in Oregon

Under the auspices of the Oregon Association of Electrical Contractors and Deal-

ers a most successful meeting was held, May 23rd, upon the visit of William L. Goodwin and Samuel A. Chase. There were 115 present at the banquet and the address of welcome was delivered by Franklin T. Griffith, president of the Portland Railway, Light & Power Company. A Highway trip was taken by the speakers as guests of S. C. Jaggard.

Electrical Meeting in Salt Lake City

The Commercial Club of Salt Lake City was the scene of a gathering of over a hundred members of the electrical fraternity of that city on Monday evening, June 2nd. The purpose of the meeting was the inauguration of a broad gauge plan for organizing the entire electrical industry along lines that would be mutually helpful to all concerned, and therefore lasting. The large and enthusiastic attendance was ample proof of the support which such an organization will receive.

The meeting was addressed by Samuel A. Chase of the Westinghouse Company and Wm. L. Goodwin of the General

BUILDERS OF THE WEST—LV.



W. L. GOODWIN

Born of a parentage that sailed through the Golden Gate in the thrilling days of '49 and '50, bringing the first news of California's admission into the Union, W. L. Goodwin, formerly of San Francisco but now special cooperative representative of the General Electric Company with headquarters in New York City, has remained true to the ideals and inspiration engendered by the daring and adventure of our early pioneers in the West. To W. L. Goodwin this issue of the Journal of Electricity is affectionately dedicated, as a lasting memorial to his genuine spirit of cooperative helpfulness which is now being felt in every nook and corner of the electrical industry throughout the nation, and even in districts beyond our national borders.

Electric Company. H. B. Kirkland, of the American Conduit Manufacturing Company, heartily endorsed the statements and plans of Mr. Chase and Mr. Goodwin, and pointed out some of the advantages of cooperation. Mr. Chase summarized the evils that have beset the industry previously, and drawing conclusions from these, pointed the way for future success. He said, in part:

"Selfishness has been the root of a great deal of trouble which has existed. In demanding settlements, each party has had in mind only the particulars which would result in his own benefit.

"Misunderstandings are the cause of a great deal of unnecessary friction. These will be avoided by open, above-board dealings, and a clear statement of policies. We have been educated up to a point where we are ready for a plan such as Mr. Goodwin's."

Mr. Goodwin called attention to the fact that there was something radically wrong in the electrical industry, and analyzed the situation to show that the prices of electrical goods were not set by actual cost determinations, with the single exception of the incandescent lamp, an exception due to the organized efforts of the jobbers. The need right now is for a strong contractor-dealers' organization, the other three branches being well organized, and this being necessary for a proper balance in the industry.

He emphasized the advantages of the trade papers to the contractor-dealer, for keeping in touch with developments as well as for statements of policy, and publicity matters.

C. B. Merrick, representing the Journal of Electricity, was called upon for a few words, and promised all possible support for the organizations planned.

As outlined, the main organization, consisting of all the various branches of the industry, will have an executive committee made up of representatives from each branch. Any difficulties between the branches will be discussed openly before the main body which will act as arbitrator. It will also actively assist the formation of a local contractor-dealers association.

Oregon Association, Electrical Contractors and Dealers

The regular meeting of the Oregon Association of Electrical Contractors and Dealers for District No. 1 was held May 19, 1919, J. R. Tomlinson in the chair. A motion was carried that the members of the association conduct a three months' campaign—"Own Your Home Wiring"—commencing June 1st, during which period the contractors will furnish and install wiring in all new residences at practically cost, eliminating overhead charges.

Joint Electrical Meeting in Portland

A meeting of electrical jobbers, contractor-dealers, central station men and manufacturers, for the purpose of stimulating interest in the various branches of the electrical industry, was held at Portland, Ore., May 21st and 22d.

California Association of Electrical Contractors and Dealers

The Santa Cruz convention of California Electrical Contractors and Dealers which will be held June 27th and 28th has outlined an interesting two-days' program. June 27th will be devoted to a members' meeting, reports of officers and committees, and various social events. At the Merchandising Session on the second day, under the chairmanship of J. C. Render, the subjects under discussion will be, "How an Electrical Store Should be Managed to Attain Success," "The Most Efficient Manner of Handling Salesmen and Solicitors," "Should the Electrical Merchants Adopt the Method of 'Clearance Sales'?" "How I keep in Touch with Costs in Contracting," and "Electrical Heating." On the afternoon of the same day there will be a motor meeting, with "What I Find Motor Sales Cost" as the subject. The proceedings will conclude with a banquet in the evening with H. F. Jackson as toastmaster.

A. I. E. E., San Francisco

At a meeting of the executive committee of the San Francisco section of the American Institute of Electrical Engineers, it was pronounced proper for the Railway Electrification Committee of the local section to cooperate with the Pacific Coast Section of the National Electric Light Association. The Railway Electrification Committee will continue its activities in accordance with this decision.

Pacific Coast Section, N. E. L. A.

The newly elected executive committee of the Pacific Coast Section, National Electric Light Association, is as follows:

Arizona—R. S. Masson, Pacific Gas & Electric Company, Phoenix; Arizona Power Company, Prescott. Nevada—Geo. A. Campbell, Truckee River General Electric Company. New Mexico—C. M. Einhart, Rowell Gas & Electric Company. Jobbers—C. C. Hillis, Electric Appliance Company. Contractor-Dealers—Frank Somers, Century Electric Company. Manufacturers—E. O. Shreve, General Electric Company. Central Stations—Wm. Baurhyte, Los Angeles Gas & Electric Corporation; Henry Bostwick, Pacific Gas & Electric Company, San Francisco; S. M. Kennedy, Southern California Edison Company, Los Angeles; A. B. West, Southern Sierras Power Company, Riverside; Samuel Kahn, Western States Gas & Electric Company, Stockton; J. B. Black, Great Western Power Company.

Many member companies of the Section are distributing to their employes pamphlet copies of S. M. Kennedy's paper "The Man in the Street," recently published in the Journal of Electricity and read at the Coronado convention.

N. E. L. A. Educational Activities

The Educational Committee of the National Electric Light Association in Philadelphia, Pa., have issued a leaflet dealing with their educational plans and blue print illustrating their method of advertising. These were planned by Ross B. Mateer of the Philadelphia Electric Company. Mr. Mateer is a frequent contributor to the Journal of Electricity.

Engineers' Club of Seattle

At the weekly luncheon of the Engineers' Club of Seattle, held on May 22, Chemical Engineer Bissell of the Puget Sound Navy Yard discussed "Electric Arc Welding as Employed in Ship Construction in the United States Navy Yards." Mr. Bissell is an expert on electric welding, having done much to develop this type of fastening as used in the fabrication and erection of ships. His address was both interesting and instructive.

Convention of Advertising Men

The sixteenth annual convention of the Pacific Coast Advertising Men's Association took place at Portland, Ore., June 8th to 11th, when a full and interesting program was carried out. Among the speakers were Felix Orman, Dr. William Trufant Foster of Portland, and F. W. Kellogg of San Francisco. Features of the convention were an elaborate series of advertising exhibits, and a Trade Mark parade.

Jovian Electric League

At the weekly luncheon of the Jovian Electric League, held on May 28th, Dr. Baker P. Lee delivered an address entitled "Olympus and Service." Charles W. Duncan spoke on Electricity in Advertising.

Washington Electrical Contractors & Dealers

A good attendance and much interest were features of the meeting of the Washington Association of Electrical Contractors and Dealers held at Seattle on May 28. The day meeting, which took the form of a free discussion, was devoted to the electrical contracting and sales business and the relation of other lines with the jobbers, central stations and manufacturers. There were 120 present at the banquet in the evening. W. L. Goodwin and Samuel A. Chase were the speakers.

Seattle Meeting of Electrical Contractor-Dealers

A meeting of jobbers, contractors, dealers, manufacturers, central station men and others interested in the electrical industry, was held at Seattle, Washington, May 23d.

California Electrical Cooperative Campaign —

The Advisory Committee of the California Electrical Cooperative Campaign held its regular monthly meeting at the Los Angeles Athletic Club rooms in Los Angeles on Friday and Saturday, June 6-7, 1919. The committee decided to broaden its activities by appointing a salesmen's auxiliary, the purpose of which is to apprise the jobbers of the campaign activities. A much broadened sphere of activities for the campaign was outlined by Chairman Newbert in regard to the problem of assisting the Public Policy Committee of the Pacific Coast Section, N. E. L. A., in its campaign of public education.

Robert Sibley, editor of the Journal of Electricity, outlined an activity of the Extension Division of the University of California whereby a course in elementary accounting, agreeable to the system advocated by the National Association of Electrical Contractors and Dealers, will be introduced at once and the text for the course appear in early issues of the Journal of Electricity. The idea received the hearty and unanimous approval of the committee.

At luncheon the following were present to learn more of the helpful activities of the Campaign:

L. H. Newbert, Chairman of Advisory Committee, California Electrical Cooperative Campaign; H. L. Harper, Los Angeles manager Western Electric Company; K. E. Van Kuran, Los Angeles manager Western Electric & Manufacturing Company; J. O. Case, Los Angeles manager supply department, General Electric Company; I. W. Alexander, commercial department, San Joaquin Light & Power Corporation; R. M. Alvord, San Francisco manager supply department, General Electric Company; W. L. Frost, assistant general agent, Southern California Edison Company; G. E. Arbogast, vice-president California Association of Electrical Contractors and Dealers; J. C. Rendler, president of the Southern California Electric Company; M. L. Scobey, general manager Home Electrical; W. S. Berry, Pacific Coast salesmanager Western Electric Company; M. A.

DeLew, president California Association of Electrical Contractors and Dealers; Harry Holabird, Holabird Electric Company; Frank Airey, Los Angeles manager Pacific States Electric Company; C. B. Hall, Los Angeles manager Illinois Electric Company; A. L. Spring, Field Agent, California Electrical Cooperative Campaign; N. W. Graham, manager Graham-Reynolds Company; D. E. Harris, sales manager Pacific States Electric Company; A. W. Childs, in charge of sales, Southern California Edison Company; S. A. Sharpe, Field Agent, California Electrical Cooperative Campaign; P. H. Booth, Pacific Coast sales manager Hotpoint Division, Edison Electric Appliance Company, Inc.; C. D. Lamoree, Los Angeles manager supply department, Westinghouse Electric & Manufacturing Company; Wm. Baurhyte, vice-president Los Angeles Gas & Electric Corporation; Robert Sibley, editor Journal of Electricity.

WESTERN MEETINGS

June 4th—Jovian Electric League, Los Angeles—Capt. Frank Bristol, A. R. C.—“Conditions in Germany Since the Signing of the Armistice.”

June 9th—San Francisco Electrical Development League—Thomas H. Reid—“Municipal Government.”

June 10th—National Electric Light Association, Portland Sections—E. F. Whitney—“The Flash and Sound Method of Range Finding.”

Just as these forms go to press, word is received that the next annual meeting of the National Electric Supply Jobbers' Association will be held at Del Monte, probably during May, 1920. This bears out the leading editorial on page 561 of this issue, “1920 — The Year of Years in the West.”

Briefs of the N. E. L. A. Convention

(The National Electric Light Association held its forty-second Convention at Atlantic City, N. J., May 19-22, 1919. This gathering is one of the most important national events of the year for the electrical world, and in order that our readers may have some idea of the subjects discussed, we print here very brief abstracts of the papers and committee reports read at the Convention.—The Editor.)

PRESIDENT BALLARD'S PLANS

Addressing the delegates of the National Electric Light Association at the Atlantic City convention, on the occasion of his recent election to the presidency of the association. R. H. Ballard of the Southern California Edison Company asked the cooperation of all members in forwarding the interests of the association, and urged a large attendance at the next convention, which is to be held in Los Angeles.



The new President of the N. E. L. A.

At the close of the Atlantic City convention Mr. Ballard went to New York to discuss matters affecting the activities of the Association during the coming year. A number of conferences were held at Association headquarters with different men interested in the welfare of the industry, and much progress was made in the settlement of various questions.

One of the most important matters which was finally arranged is a new plan for the active participation of the four vice-presidents in the real work of the Association. Such a plan is especially desirable under the conditions of this year because of Mr. Ballard's residence on the Pacific Coast. It, however, serves also the good object of decentralizing the burden of responsibility upon the president, and of bringing the vice-presidents into close contact with certain phases of the Association work.

The plan approved by President-elect Ballard is as follows:

President Ballard will devote himself specially to matters of a general executive character.

Martin J. Insull, the first vice-president, will be executive vice-president. He will be present to preside over all meetings of the Executive Committee in case of the necessary absence of the president.

M. R. Bump, second vice-president, will supervise the work of the Technical and Hydroelectric Section. Mr. Bump will also specialize on the preparation of plans for organizing the entire country into geographic districts and sections.

Frank W. Smith, the third vice-president, will supervise the Accounting Section in the same way that is outlined for Mr. Bump with the Technical and Hydroelectric Section. Mr. Smith will also supervise the work of the Association headquarters.

W. H. Johnson, the fourth vice-president, will supervise the activities of the Commercial Section and the Electric Vehicle Section, following the same method as the other vice-presidents with respect to other Sections. Mr. Johnson will also specialize on the enlargement and development of the Company Sections.

The arrangement by which the work of the Sections is assigned directly to the various vice-presidents does not, of course, preclude the chairman of a Section from taking up any matter directly with the president if he so desires.

Another matter which was under discussion during the visit of Mr. Ballard in New York is the possibility of two or more general executive conferences of the company members at appropriate times during the year. The object will be to discuss some of the questions affecting the entire industry. It is suggested that possibly one of these conferences might be in New York and one in Chicago.

Mr. Ballard spent two weeks in the East after the convention, visiting several large cities before going to Los Angeles. He plans to return to New York in September for a stay of considerable length, and again in December or January. In order to complete his plans for the 1920 convention he will go East again in April of that year. With these visits and the new plan of organization of the vice-presidents, Mr. Ballard expects the Association work to go ahead on the

broader and more active lines which are outlined for the coming year.

GENERAL SESSION

Committee on Company Sections —

Company Sections were affected by the war to a greater extent, perhaps, than any other department of the N. E. L. A. work. Thirty-seven Sections disbanded and seventeen temporarily suspended activities.

An amendment to the Constitution was advocated providing for a limited class of membership in Company Sections and affording a more dignified status for Class B members. The tendency to form local employees' clubs should be offset by more liberal provision for membership in Company Sections.

Report of W. J. Blood, Jr., Insurance Expert —

The Insurance Expert represents the N. E. L. A. on the Electrical Committee of the National Fire Protection Association, and is charged with seeing that no rules which would retard the development of the electric light and power industry are incorporated in the National Electrical Code.

The work of the Electrical Committee is now to be conducted by technical and standing committees which will undertake detailed investigations. In this way the committee at its biennial public meeting will have more definite material to work upon than that usually evolved during the discussion at the meeting itself.

COMMERCIAL SECTION

Committee on Commercial Aspects of Lamp Equipment —

The report states the necessity for educational work to bring the public to realize the danger of unprotected lamps.

The various new developments in equipment have been investigated and tabulated, and their relation to different kinds of installations considered.

Committee on Store Lighting —

The various classes of stores and their relations to the central stations are described in the report. The ordinary store, existing in considerable numbers in every city, is most important from the standpoint of obtaining new business rapidly. A campaign to interest this branch of the industry is outlined, and the purpose and possibilities of window lighting are discussed.

Committee on Electrical Advertising —

The report points out the undoubted prosperity ahead for electrical advertising. A recommendation is made that central stations conduct a canvass to have old signs relighted and relamped, and that new business be taken care of by reviving the companies whose activities lapsed during the war. The report also recommends the use of the phrase "Electrical Advertising" in preference to "Electric Signs."

Committee on Outdoor Lighting —

The opportunities for illumination are pointed out with regard to monumental structures, pageants and displays, flags, festivals, and night recreations. All outdoor lighting was much in abeyance during the war, but victory has given it a sudden impetus in use at peace festivals, and the time for more extensive development is now ripe.

Committee on Lighting of Public Buildings —

The functions of this committee are the study of sales methods and campaigns to obtain new business, and the correcting of existing inefficient lighting installations of public buildings.

Closer relations between the central stations on the one hand and the engineers, architects and contractors on the other are desirable.

Monographs on the subject of the several classes of lighting should be prepared by the N. E. L. A. for the use of central stations.

Residence Lighting —

Owing to war restrictions, progress in residence lighting work has been limited. Building, however, is now increasing and house-wiring campaigns are making headway. An increased use of electrical appliances and the elimination of empty sockets will do much to make residence lighting more profitable.

Committee on Publications —

At the request of the Board of Fire Underwriters the committee issued and sold a leaflet instructing customers in the right way to use electric appliances, and recommends that such leaflets be enclosed in each package containing an electric appliance sold to customers.

A publicity program was carried out, including a Christmas folder, a Housewiring Book, "Right Way to Use Appliances," and a Publicity Campaign in Central Stations.

Committee on Education —

The courses in Commercial Engineering and Practical Electricity have been continued on a self-supporting basis.

In conducting a campaign starting Feb. 1st the committees of the Commercial and Accounting Sections combined to avoid the complexities of two separate campaigns.

It is urged that each member company adopt these courses in rebuilding their present impaired organizations into permanent organizations.

Salesman's Handbook —

A list of new material, in the form of monographs, is suggested for insertion in the Handbook, these monographs to cover subjects of special interest to the electrical salesman.

The committee calls attention to the increased cost of the Handbook, and the fact that the stock of the present edition has been exhausted.

Committee on Commercial Service and Relations with Customers —

The report deals with the practice of various companies in regard to applications, credits, meter reading, collections and complaints. A questionnaire was sent out to companies in various sections of the country, and thirty-eight replies were received.

The committee recommends effort to bring about greater uniformity in commercial relations with the customer, and ultimately the compilation of a handbook on standard practice in this department.

Committee on Coordinate Advertising and Sales Campaign —

This committee was organized on the theory that definite drives or campaigns on electrical "leaders" create a maximum of public interest in things electrical.

A Merchandising Schedule and a Lighting Schedule were drawn up, suggesting a leader for each month. A monthly reminder is to be sent to the member companies six or eight weeks in advance of each special sale.

Committee on Wiring —

The report covers investigations of the various kinds of wiring with special reference to safety factors and the advantages or disadvantages of standardization.

A discussion of the National Electric Code is presented; also an appendix embodying the results of tests of slow burning vs. rubber insulation.

ACCOUNTING SECTION

Report of Committee on Purchasing and Store Room Accounting —

The report deals with the keeping of stock records by bookkeeping machines, the employment of women in stock rooms and an improved method of storing barrels. Some new developments in transportation and moving equipment are

described, together with a baling machine for handling copper wire, and a cable stripping machine.

Committee on Operating Records —

The report covers a set of forms to be used in connection with the standard uniform system of accounting for transportation work of central station companies, as reported to the 1917 convention by the 1916 and 1917 Operating Records Committee.

It is recommended that the Association print these forms in quantities for purchase at minimum cost by member companies.

The report gives 15 forms for general adoption with full explanation as to their use.

Committee on Accounting Service to Member Companies and the Monthly Bulletin —

A large number of member companies made use of the committee's services in the solution of their accounting problems, and a great number of inquiries have been handled.

The report outlines the types of questions and the procedure followed in dealing with them.

Committee on Customers' Records and Billing Methods —

This report deals with the importance of maintaining an efficient clerical force, and emphasizes the need of providing ways and means for its advancement and education. It reproduces a number of representative Ledger Forms, and reviews a system which eliminates the ordinary Customers' Ledger for the major portion of monthly transactions. A brief description of modern billing methods is added.

Committee on Accounting Education —

The committee has been engaged on the preparation of the lessons of the Advanced Course in Accounting and in bringing before the industry the value and importance of the courses. A Sales campaign was conducted and arrangements made for a joint Education campaign with the Commercial Section. The scope of the courses is briefly outlined.

Committee on Form of Annual Reports to Commissions —

The committee reports its failure to secure the aid of the National Association of Railway and Utility Commissioners in obtaining a reduction of the burdensome requirements of annual report forms prescribed by Public Service Commissions.

Attention is called to the fact that the Commissions are more responsive to representations from citizens of their respective states than to those from an inter-state organization. The companies of each state are urged to interest themselves directly in the matter.

Committee on Cost Accounting and Statistics —

Disorganized on account of the war, this committee was not reorganized in time to present results at this convention.

The committee suggests that its object be stated as the study of principles and methods of cost accounting for electric light and power companies, and the recommendation to the Association of methods and systems that may be of value to the member companies.

Committee on Commission Accounting Rulings —

The committee, whose operations have been seriously interrupted by the war, is endeavoring to obtain a classified list of all Commission Accounting Rulings issued up to the present time, in order to make a comprehensive study of them. It appears that Commission rulings on the subject of issuing bonds, notes and obligations have been contradictory.

Other subjects which the committee considers as needing special study are depreciation, reserves for replacements, and sinking funds.

ELECTRIC VEHICLE SECTION

Manufacturers' and Central Station Cooperation Committee —

The committee recommends the immediate collection of all possible data pertaining to the electric vehicle, and the dissemination of this data among members of the Section and others interested in transportation engineering. The committee is of opinion that the industry will be greatly stimulated if the facts can be properly put before the public.

Committee on Standardization —

The work of this committee is at present chiefly that of an advisory or consulting committee to the Society of Automotive Engineers, which is handling matters of standardization relating to electric vehicles. The report gives a review of standardization previously effected, and an outline of features to be considered in the future.

Committee on Legislation —

The report ascribes the stringent regulative legislation concerning motor vehicle traffic to the lack of durability of country roads and the consequent injury resulting from heavy traffic; the electric vehicle has suffered along with the others. The laws of Maryland with regard to license fees differentiate in favor of electric vehicles, and the committee advocates cooperation with the National Automobile Chamber of Commerce to obtain a uniform motor vehicle tax law, with a suitable differentiation in favor of electric vehicles.

Committee on Garage and Rates —

Prior to cessation of activities occasioned by the war the committee considered the standardization of an interchangeable battery compartment, and also cooperated with local committees in the settlement of differences regarding rates furnished by central stations.

The garage situation as a whole is considered satisfactory, new garages being provided whenever necessary; the majority of member companies are giving rates sufficiently low to attract business.

The Proper Application of the Commercial Electric Vehicle —

(Paper by F. F. Sampson)

This article gives the reasons for the failure of the electric vehicle in cases where it has been misapplied in the past, and shows the large field for the electric within its radius of operation. Some statistics are given concerning the number of electrics in the New York Metropolitan District and the number of different lines of business using the electric vehicle.

It is suggested that facts and figures on the cost of hauling with the electric vehicle be widely distributed among prospective users.

The Electric Vehicle from the Salesman's Standpoint —

(Paper by J. B. N. Cardoza)

This article points out the reason why electric trucks for operation under 45 miles per day are not used more extensively, and shows that the condition can be remedied by having a report made as to its economy by three unbiased, nationally known consulting engineers in conjunction with a certified accountant.

A plan is suggested for handling the funds for battery renewal, and a trade journal, devoted exclusively to the interests of the electric street truck, is advocated.

The Present and Future Status of the Electric Vehicle —

(Paper by Rodney K. Merrick)

The article reviews favorably the present conditions in the electric truck industry, and predicts a bright future. The reasons given for the expectation of wider use of electric trucks are: the real worth of the modern electric itself, the

fact that users have found the gasoline truck to be a poor investment for city work, and the fact that high wages are causing speeding up. The cooperation of central stations is urged in stocking converting apparatus, or giving discount to manufacturers who stocked it.

Electric Industrial Trucks and Tractors and Their Relations to the Central Station Load —

(Paper by E. J. Bartlett)

This paper covers its subject under the headings of present manufacturing capacity, industrial vehicle work, the volume of business involved, charging current required, and central station influence. The paper aims to show the great possibilities of industrial tractor and truck development, and to enlist the interest of those who should be concerned in this development.

TECHNICAL AND HYDROELECTRIC SECTION

Committee on Prime Movers —

The report discusses various phases of the problem of selecting turbines and includes information as to the operating records of large sized turbines, together with statements submitted by manufacturers. The development of condensers, boilers, superheaters, stokers, economizers and power station auxiliaries is covered in detail, and the advantages and disadvantages of higher steam pressures are discussed.

The report includes a general survey of water-power

development during the past year and notes the tendency towards fewer but larger units.

The production of fuel oil from various fields in the United States is tabulated, and the development of Diesel engines referred to.

Committee on Overhead Lines and Inductive Interference —

The report is confined mainly to a discussion of the present status of certain essential problems and of future policies in connection therewith.

The inductive interference situation has not shown marked development during the war, but a movement has been inaugurated to establish wave shape limitation for new synchronous power apparatus. Considerable attention is being given to joint use of poles by power and telephone circuits, and numerous movements looking to standardization and improvement in line materials and designs are under way.

Committee on Underground Construction and Electrolysis —

This report discusses current carrying capacity of cables, dielectric losses in cables, cable failures, cable fault location, fireproofing of cables in manholes, selection of duct sizes, installation of subway transformers, joint filling of compounds, Edison three-wire system, underground street lighting circuits, junking of cable, and transformer primary cut-outs. A topical index has been prepared to put previous reports of the committee in a convenient form for reference.

HAPPENINGS IN THE INDUSTRY

VISIT OF FRENCH COMMISSION

The officially approved French Commission, consisting of a group of engineers, railway operators and government officials arrived in Pittsburgh from Altoona, Pennsylvania, to visit and familiarize themselves with the operation and manufacture of electric railway equipments.

They will spend several days in Pittsburgh, inspecting electric locomotives at the Westinghouse Electric & Manufacturing Company plant, East Pittsburgh, Pennsylvania. They will also see one of the ten new passenger electric engines which are being built for the Chicago, Milwaukee and St. Paul railroad. These will be the most powerful locomotives running in passenger service, any one of the ten locomotives having a capacity sufficient to haul 950 tons (12 steel cars) over the entire mountain section at the same speed as called for by the present schedule.

In addition to inspecting locomotives, the delegation will also make an inspection trip of the entire Westinghouse plant at East Pittsburgh, and will be the guests during their stay in Pittsburgh, of E. M. Herr, president of the Westinghouse Company.

APPROPRIATIONS FOR POWER SURVEY ASKED

The movement to obtain appropriations for a power survey of the United States is again under way. The appropriation committee of the House of Representatives will probably begin consideration of the various items at an early date. If the desired appropriations are made they will permit the Geological Survey to expend \$250,000 in the studies of power supply during the coming fiscal year.

OPERATING MILKING MACHINES

An opportunity for California dairymen to learn how to operate milking machines will be given in a University of California Short Course in Animal Husbandry which is to be

held at the University Farm, Davis, from October 20 to November 7. A circular of information concerning this and other short courses may be had by applying to the Dean of the Farm School at Davis.

LICENSING ARCHITECTS IN OREGON

The law passed in Oregon providing for the licensing of architects and the examination of applicants became effective May 29th, and the state board of architect examiners has been appointed by the governor.

LAUNCHING OF CONCRETE SHIP

The new 7500 ton reinforced concrete ship "Palo Alto" was launched by the San Francisco Shipbuilding Company at Government Island, Oakland, California, on May 29th. The event was one of great interest and passed off very successfully.

INCREASED CAPITALIZATION OF JAPAN'S ELECTRICAL INDUSTRIES

In respect of funds invested, the electrical industry in Japan has a lead over several even of the greatest industries, says a recent report issued by the Department of Communications, on the achievements of the industry last year. The investment increased by as much as 64,515,000 yen (\$32,160,727) during the last twelve months.

The boom in fuels has given the electrical industry a developing incentive. At the end of last year the use of electrical power was thought to be economizing coal to the extent of 4,000,000 tons. The investments in light and power plants and in electric tramways show a phenomenal increase.

FOUR PUBLIC SAFETY HEARINGS

The Industrial Accident Commission held four Safety Hearings in San Francisco and in Los Angeles during the

past two weeks. These were as follows: a proposed Safety Order dealing with Exits, to be added to the Electrical Station Safety Orders; tentative Steam Shovel and Locomotive Crane Safety Orders; tentative General Light Orders and tentative Tunnel Safety Rules.

These hearings were open to all, and afforded opportunity for objection or constructive criticism of any of the proposed Safety Orders or Safety Rules. Committees of employers and employees cooperated with the engineering staff of the Industrial Accident Commission in the preparation of the Orders and Rules.

The Industrial Accident Commission of the State of California is continually trying to reduce the industrial toll. Each working day two employees are killed in this state. Approximately 10,000 industrial injuries are reported to the Commission each month. The slogan of "Safety First" needs every vitalizing energy to add to the Commission's endeavors.

COURSE IN SALESMANSHIP

A new Extension class under the University of California has started in San Francisco, beginning Tuesday evening, May 27. The course, which is to consist of fifteen lectures and discussions, is under the direction of James Lynch, well known as an expert in Salesmanship. The class meets on Tuesday evenings at 7:30 o'clock in the lecture room on the third floor of the main Public Library, Civic Center. Enrollments for all courses are being made at the University Extension office, Market at Second street, San Francisco.

ENLARGEMENT OF PLANT

The Robbins & Myers Company of Springfield, Ohio, has just completed a deal for the purchase of all the factory buildings of the James Leffel Water Wheel Company adjoining the Robbins & Myers plants in Lagonda. The company will increase its force from 3000 to over 5000, and contemplates extensive reconstruction and new equipment for the additional buildings. It will also acquire switching spurs now used by the James Leffel Company.

AERIAL PHOTOGRAPHY IN THE U. S. ARMY

The Army is to have a school of aerial photography with expert aerial photographers, who have seen service, as instructors. Recruiting for this branch of the army service is now being carried on.

TRADE NOTES

Business Deals —

The Water Board of the City of Bellingham, Washington, recently placed an order with the Coast Culvert & Flume Company of Portland for 5500 feet of 18-inch and 24-inch water pipe to be made from "Aimco" iron electrically welded. This pipe is to stand a pressure of from 140 to 220 foot head.

Erwin Kron of Dinuba, California, has sold his electrical supply shop to H. W. Stitt.

New Partner —

Salisbury Field has been admitted as partner to the firm of Fred A. Downer & Co., electric supplies and contractors, 1119 State street, Santa Barbara.

New Representatives —

King-Craymer Company, 1133 Broadway, New York, have been appointed as the representatives of the Ajax Electric Specialty Company in the eastern states.

New Business

Whitefish, Montana, is showing great business activity along several lines. The Mountain States Power Company has come in for a considerable share of this, and records two

recent installations—one 50 h.p. motor in the Diamond Brick Yards and one 75 h.p. motor for the Hutchinson Lumber Company. The Mountain States Company has also just placed an order with the General Electric Company for a carload of electrical ranges.

L. E. Sperry, representative of the Webster Manufacturing Company, San Francisco, reports several orders from industrial plants for the Webster car puller.

New Offices and Stores —

Geo. A. Gray Company, electrical manufacturers' representatives, have opened offices and stock rooms on the ground floor at 589 Mission street, San Francisco. The sales organization consists of Geo. A. Gray, who was for many years Pacific Coast representative of the Crouse-Hinds Company, and R. L. Cameron, formerly a salesman with the Pacific States Electric Company.

The Zarwell Electrical Company has recently opened an attractive store at 2333 Santa Clara avenue, Alameda. Mr. Zarwell was only recently discharged from the service.

The Standard Electric Company, formerly at 75 Horton street, Seattle, has moved to 2931 First avenue, South, where it has leased a large shop and warehouse and will carry a complete line of new and used motors and electrical machinery. The company is to continue in the construction business, specializing in mill and industrial work and all kinds of ship wiring.

Electric Signs in Stockton —

There are more electric signs per capita in Stockton, Cal., than in any other city in the country, according to the recent survey of the Electrical Products Corporation. This Corporation alone has shipped more signs to Stockton during the past four months than have been erected in many cities four times its size.

Representatives Appointed —

The Jewell Electrical Instrument Company have appointed C. F. Henderson, of San Francisco, as their representative for northern and central California. He will handle a full line of indicating, portable and switchboard types of meters.

The Roller-Smith Company, 233 Broadway, New York, announces the appointment of A. H. Savage, president of the South Dakota Power Association, as its representative in St. Paul, Minnesota. Mr. Savage's offices are in the Pioneer Building and he will handle the Roller-Smith Company's products in Minnesota, North Dakota and part of Wisconsin and South Dakota.

W. R. Hendrey Company, 325 Hoge Building, Seattle, has been appointed agent for Oregon, Washington and Alaska of the McMyler Interstate Company of Cleveland, Ohio, which makes a specialty of locomotive cranes, coal handling plants, railroad locomotive pile drivers and hammerhead cranes which are extensively used in shipyards.

New Supply Company to Begin Business —

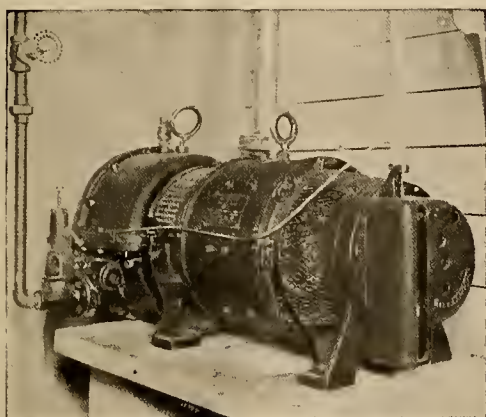
The Seattle Electrical Supply Company has been organized by M. V. Underwood, formerly with Miller & Sons, Northern Pacific contractors, H. B. Sawyer, recent manager of the appliance department of the Puget Sound Traction Light & Power Company, and E. A. Norton, recently with the sales department of the Pacific States Electric Company, Seattle. The object of the new concern is to merchandise electrical equipment, adopting the slogan "Electrical Home Needs"; in other words, to handle a full line of electrical appliances for the home. The new concern is located at 509 Pine street.

LATEST IN EVERYTHING ELECTRICAL

(The demand for compactness in equipment is met in the case of the tug boat by the turbo-generator illustrated below, and in the case of the aviator by a convenient radio set. The new Safety Cars recently put into operation in Utah are also described, together with a welcome device for facilitating ironing, a new swivel head for a soot cleaner, a resiliometer, and screw connectors with improved features.—The Editor.)

A COMPACT LIGHTING PLANT FOR TUG BOATS

A little electric lighting turbo-generator, that can literally be put out of the way on a shelf, is now being installed in a number of tug boats and other small harbor, river and coast vessels.



Westinghouse 7 1/2 kw. d.c. generator

The set illustrated was built by the Westinghouse Electric & Manufacturing Company and is in use on a U. S. Government tug boat. It is of 7 1/2 kilowatt capacity, generates direct current at 250 volts, and has sufficient power to provide current for all the 14 or so lamps needed on board and for the searchlight as well.

It consists of an impulse-type steam turbine and an electric generator, combined to form a single, compact unit.



United States Government tug boat, electrically equipped.

The turbine consists of a single impulse wheel. It takes steam of from 70 to 225 lbs. directly from the boiler without a reducing valve, and can be operated either condensing or non-condensing. The exhaust steam is free from oil and can be used for heating purposes. The speed is 4000 r.p.m., and an automatic governor prevents over speeding.

RADIO SETS FOR AIRPLANES

Among the contributions to scientific advancement which have been evolved during the war, the various devices for making the aeroplane an effective agent hold an important place. The necessity of keeping the pilot in touch with the earth resulted in the development of a radio telephone set for airplanes. Space, weight and shape were limited, and the engine and wind noises and the irregular vibrations of the machine offered serious obstacles to the success of the device. Storage batteries would have been too heavy, and it was deemed unwise to make attachments of generators to the airplane motor. The illustration shows a radio set made by the Western Electric Company, and designed to overcome the obstacles of bulk and



The radio set is light and compact to conform to limitations of air travel heavy storage batteries. The special helmet which goes with the apparatus eliminates the interference of engine and wind noises.

METHOD FOR DETERMINING MECHANICAL QUALITIES OF COMPRESSIBLE MATERIALS

During the war the government experienced considerable difficulty with the specifications on raw materials—particularly in the explosive section. Here a serious problem arose through the failure of shells to explode according to preconceived determination. A number of tests on the firing field showed that the whole trouble was in the felts—that they were not running sufficiently uniform either in thickness, hardness or resilience.

An instrument which records in positive figures the Normal Thickness, Hardness, Hysteresis and Resilience of all Compressible Materials, has been invented by W. S. Widney.

The principle of the Widney Resiliometer is surprisingly simple. Normal thickness and hardness are recorded in figures on the dial. Hysteresis and resilience are recorded in graphs and are determined by applying weight in successive increments of the same amount and releasing the load in corresponding decrements.

A CONVENIENCE IN IRONING

One of the few inconvenient features of the electric iron has been the tendency of the cord to get in the way while the iron is being used. This annoyance is eliminated by the cord and wire coiler developed by the Haynes Manufacturing Company of Salt Lake City, Utah. The device consists of a small spiral spring made of highly tempered spring steel and



formed into a spiral into which the electric iron cord folds. It brings the surplus cord up into a neat coil, keeping it entirely out of the way, but it allows full play of the iron to the entire length of the cord, the resistance of the spring being so slight as not to necessitate extra effort. When the iron is not in use the cord takes the form of a compact and convenient coil.

NEW SWIVEL HEAD

To be successful a swivel head must provide for four things: (1) it must permit easy turning of the soot cleaner element by simply pulling the chain shown in either direction; (2) it must take care of expansion and contraction of the connecting pipe line; (3) it must not leak steam; (4) it must not permit air infiltration.

In a new swivel head for the Vulcan Soot Cleaner steam from the boiler passes into the swivel head from the bottom through a vertical pipe, and thence into the horizontal element which extends from the swivel head through the brick wall and into the setting. After the steam is turned on the operator simply rotates the element slowly from one extreme to the other. Steam turbine nozzles inserted in the element and correctly spaced discharge the steam between the tubes in high velocity jets, and in the course of rotation the tubes are thoroughly freed from soot. The limitations of rotation are easily regulated by stops attached to the link chain. A pointer from one arm of the sprocket plainly indicates to the operator the direction in which the steam jets are discharging.

The method of packing the stuffing box is designed in such a way that when steam is turned on friction is relieved and turning the element by hand becomes easy.

To take care of expansion and contraction a gas tight, sliding joint is provided between the sprocket wheel and the metal housing that is mortared into the brickwork. As the vertical riser expands or contracts, the swivel head moves up or down and the attached end of the element must of course follow. This new sliding, rotating swivel head is so designed that air in-leakage becomes impossible because of an air-tight plate used in the sliding joint.

As is well known, in ordinary settings where the hand lance is used for cleaning, air in-leakage is enormous and much fuel is lost due to that cause alone. The effective sealing up of all cracks with the installation of a mechanical soot cleaner is in itself an important coal saving item.

NEW SAFETY CARS IN OGDEN, UTAH

Five "one-man safety" cars have been purchased by the Utah-Idaho Central Railway Company for operation in Ogden. The cars will so reduce expenses of operation that the men who operate the new "safety" cars can have higher



These safety cars are equipped with Westinghouse 506 motors, K-63-B controllers, and Westinghouse air brakes.

wages and the people will not be required to pay the six-cent fares which have been established in many cities.

As a first requirement, the cars are almost absolutely safe. They are fool-proof and almost accident-proof. If the motorman were to jump from his position at the controller,



The party which made the test trip in the first of the five one-man safety cars recently put in operation in Ogden, Utah.

the car would come to an immediate stop. The annoying step from the vestibule into the car, used on heavier equipment, is done away with; the cars operate with more speed than the larger cars, and the cost of operating, particularly the cost of electric power, is materially reduced.

IMPROVED SCREW CONNECTORS

In the screw connectors shown in the illustrations the manufacturers have aimed at producing an improved version of a familiar and widely used type. The connectors are made



Owing to the fact that these connectors are rust proof they can be used over again when removed from temporary work

from solid brass rod, with screws heavily galvanized and therefore rust proof. The number is plainly stamped on each connector to facilitate sorting and re-ordering. These connectors are manufactured by the H. B. Sherman Manufacturing Company of Battle Creek, Michigan.

Books and Bulletins

Industrial Electrical Measuring Instruments

By Kenselm Edgecombe, M. Inst. C. E., M. I. E. E. 414 pp., 5¾ by 8½ in. Published by D. Van Nostrand Company, New York, and on sale at the Technical Book Shop, San Francisco. Price \$5.

Though this book is a "Second Edition," the progress in the subject which has been made since the first edition has necessitated such extensive revision and enlargement that the entire work has been re-written.

The author aims especially at concreteness in his treatment, and for this reason avoids mathematics as far as possible. There are some two hundred and sixty illustrations, all line drawings instead of photographic views. It is the author's opinion that these best serve the purpose of engineers, for whom the book is intended, and the validity of his idea is borne out by the success of the first edition, in which the same plan was followed.

In the preface the writer draws attention to the sections which have been specially enlarged as those on Constructional Details, Power Measurement, Induction Instruments, Current and Pressure Transformers, and Graphic Instruments.

Principles of Transformer Design

By Alfred Still, M. Inst. C. E., Fel. A. I. E. E., M. I. E. E. 216 pp.; size 5½ by 7¾ in. Published by John Wiley and Sons, Inc., New York, and on sale at the Technical Book Shop, San Francisco. Price \$2.25 net.

The object of this volume is to deal with the theory and design of alternating current transformers exclusively, without including other types of electrical machinery. It aims to be of use to students taking advanced courses in electrical engineering, and to this end treats its subject with great thoroughness and detail. A portion of Chapter II has already appeared in the form of articles, but the greater part of the material has not previously appeared in print.

The volume is provided with a complete index to subject-matter, and a supplementary index of tables, curves and formulae.

Descriptive Folders

"Melting Metal with Electrically Heated Pots" is the title of a new 6-page envelope folder which has just been published by the Cutler-Hammer Manufacturing Company of Milwaukee and New York. This folder calls attention to the advantages of electrically heated melting pots over gas and gasoline, on account of cleanliness, elimination of open flame, greater efficiency and ease of control.

Illustrated folders have been received from the manufacturers of the Sprague Electric Fan.

A compact folder is issued describing and illustrating the Free-Westinghouse Electric Sewing Machine.

Sales Helps

A forceful and attractive booklet entitled "Benjamin Sales Helps for Benjamin Dealers" has been sent out by the Benjamin Electric Manufacturing Company. It describes, pictorially and otherwise, the innumerable uses of the Benjamin two-way plugs, and contains suggestions and illustrations invaluable as selling helps to dealers.

Bureau of Standards

The Bureau of Standards has issued a circular listing and describing its publications. The list will be revised from time to time and a supplement to the circular will be issued quarterly.

Bureau of Mines

Bulletin 169 is "Illinois Mining Statistics Annotated" by J. W. Thompson. The work is the result of exhaustive investigation and includes all Illinois mining laws.

Civil Engineer's Pocket Book

The Trautwine Company has just issued the twentieth edition of "Trautwine," described as the Civil Engineer's Pocket Book. This new edition is greatly enlarged.

University Circulars

The University of California issues three circulars which are the result of work at the Agricultural Experiment Station. The first, No. 210, is by Thomas Forsyth Hunt and other members of the staff, and is entitled "Suggestions to the Settler in California." It contains a number of useful articles on agriculture. The second, No. 212, is "Salvaging Rain-Damaged Prunes," by W. V. Cruess, and the third "Saving Raisins by Sulphuring," by Frederick Bioletti and A. E. Way.

The University of California has issued a bulletin covering the military activities of 1917-1918 carried out as a part of its war service.

Grinding Wheels

The Maxf Grinding Wheel Corporation has issued a well bound and illustrated catalog of grinding wheels and rubbing bricks, together with a separate pamphlet containing a Safety Code for the use, care and protection of abrasive wheels.

Thrift Education in the Schools

A pamphlet embodying suggestions and recommendations for thrift education in the schools has been issued by the State Director for Northern California.

The Cement Gun

Under this title, as Bulletin 122, appears the reprint of a paper by Bryan C. Collier read before the Municipal Engineers of the City of New York.

Annual Reports

The Department of Telephones and Department of Railways of the Province of Saskatchewan have issued their annual reports for the financial year ending April 30, 1918.

The General Electric Company has issued its twenty-seventh annual report to stockholders, covering financial activities for the year ending December 31, 1918.

Prices

The Information and Education Service of the U. S. Department of Labor has issued in pamphlet form an address by T. S. Holden on Prices During the War and the Readjustment Period. The address was delivered before the American Institute of Architects, New York Chapter, April 9, 1919.

Measuring and Regulating Apparatus

The Precision Instrument Company of Detroit, Mich., has issued a large and attractive catalog on "Pico" Products. It is printed on heavy paper and profusely illustrated.

Wiring Devices

A most attractive catalog, bound in a cheerful red and green cover, is issued by Pass & Seymour, Inc. The booklet, which contains some 140 pages, illustrates and describes a complete line of standard electric wiring devices. At the end two blank pages are provided for memoranda.

Biennial Report

The Department of Engineering of the State of California has issued its sixth biennial report, covering the period from December 1, 1916, to November 30, 1918. The volume is provided with maps, tables, and numerous photographic illustrations.

Pacific Gas and Electric Annual Report

In their Thirteenth Annual Report, covering the fiscal year ending December 31, 1918, the Pacific Gas & Electric Company publish a full financial statement and a review of the year's activities in the various departments.

NEW ELECTRICAL DEVELOPMENTS

(Several new electrical companies have been incorporated in the Northwest, and a variety of new installations and power projects are reported from that district. The Pacific Central region shows great activity in questions of irrigation and city lighting, while from the Southwest come reports of important new plants. A new transmission line and city lighting plans are features of Inter-Mountain activities.—The Editor.)

THE PACIFIC NORTHWEST

HELENA, MONT.—The Drummond Light & Power Company has been incorporated for \$50,000 by H. H. Hansen and others.

GLENADA, ORE.—The Glenada Light, Mill & Power Company has been incorporated by George H. Colter and others for \$5,000.

WALLA WALLA, WASH.—The Washington Motor & Equipment Company has been incorporated for \$25,000 by Charles H. Perry and others.

MARSHFIELD, ORE.—The Mountain States Power Company is planning to rebuild the Dutch ovens under the power plant boilers at Smith Mill.

PENTICTON, B. C.—An electric railway is being spoken of between Penticton, B. C., and Oroville, Wash., a distance of about fifty miles. Power for the line would be secured from the West Kootenay Power Company.

VANCOUVER, B. C.—The N. Lang Electric Fixture Company was awarded the electrical contract in connection with Harrison Wire & Steel Company's new plant being erected on Industrial Island. The contract was awarded by Gardiner & Mercer.

WENATCHEE, WASH.—The Okanogan Valley Power Company will soon begin work on construction of a dam and power plant on the Similkameen river, a short distance below its present power house. The new plant will have a generating capacity of 5000 h.p.

KLAMATH FALLS, ORE.—The plant of the Big Lakes Box Company has been closed for repairs and improvements. An addition will be erected and electrically operated machinery installed. A sawdust and shavings burner system, to cost \$10,000, will be installed.

BEND, ORE.—The entire flow of the Deschutes river having been tied up by the state at the request of the U. S. Government, the Bend Water, Light & Power Company will not be in a position to carry out its plans for erecting a large plant near Lava Falls, above this place.

OLYMPIA, WASH.—Sealed bids will be received by the State Board of Control at Olympia up to June 30th for construction of two cottages at the State School for Girls at Grand Mound, Washington, work to be let in four contracts: general contract, heating contract, plumbing contract and electric wiring contract.

SEATTLE, WASH.—J. D. Ross, superintendent of the city lighting department, has filed a communication with the city council urging an appropriation of \$764,360 to add a third unit to the Lake Union steam plant, adding 15,000 kilowatts to its capacity. The request was made on the basis of the heavy demand for current.

SEATTLE, WASH.—Work has started on the construction of the first two pontoons of an 18,000-ton drydock at the shipyard of the Ames Shipbuilding & Drydock Company. Six pontoons will be built, each having a lifting capacity of 3000 tons. Electrically driven pumping equipment will be installed.

ASTORIA, ORE.—The school board of Knappa-Svenson union high school contemplates the construction of a hydroelectric plant for the pumping of water to the building, for lighting and for cooking in the domestic science department. This plant will be started this summer and will be ready for the opening of the school next September.

BEND, ORE.—To provide additional power,

the Bend Water, Light and Power Company has started construction of a new unit at the auxiliary plant of the C. O. I. dam. Approximately 150 horsepower will be developed. The necessary machinery, including generator and water wheel, is already here and will be installed as soon as the necessary preliminary work is done.

SEATTLE, WASH.—A bill has been introduced in the city council authorizing and directing the Board of Public Works to proceed with the construction of the power plant on the Skagit river and carrying an appropriation of \$452,000. The city council turned down the offer of the Portland Cement Company to sell to the city an oil-fired steam electric plant at Concrete, Washington, at \$57,000.

SEATTLE, WASH.—The Western Coke & Collieries Company has engaged Herbert C. Moss of the Standard Electric Company of Seattle as consulting engineer in connection with developing large coal areas near Snoqualmie. The company contemplates the installation of an electric locomotive and haulage system, an aero tramway, compressor fans and other coal mine equipment.

SEATTLE, WASH.—Negotiations are pending between the city and Puget Sound Traction Light & Power Company for the use by the city of the traction company's surplus power. J. D. Ross, superintendent of the municipal light and power plant has prepared a statement for the utilities committee showing how the surplus current can be used by the city. The traction company has offered to sell the city surplus current when it is available.

KELSO, WASH.—The North Coast Power Company is assembling material with which to rebuild their high line from Kelso to Kalama. The line now carries a load of 6600 volts and will be rebuilt for a load of 22,000 volts. The company's line from Chehalis to Kelso carries 22,000 volts, and completion of the alterations in the line south of Kelso will enable the company to carry 22,000 volts on their line from the Kalama river power plant to Kelso. More than \$30,000 will be spent by the company in carrying out these plans.

SEATTLE, WASH.—Material has been ordered for construction work necessary to make street railway track connections and changes in the municipal system recently authorized by the city council. Superintendent Murphine states that the first work to be finished will be the track connections for the rerouting of the North End lines, the connection of the Division A tracks with the former traction line on Third avenue and the rerouting of the Capitol Hill line so that the cars will be operated on the right side of 14th and 15th avenues.

PORTLAND, ORE.—Early development of the great timber tract in Washington county held by the Eccles interests is heralded in an announcement made recently that D. C. Eccles, of Salt Lake City, is negotiating for the purchase of the United Railways, the electric railroad owned by the Great Northern and Northern Pacific running from Linnton, 19 miles west of Wilkesboro, Ore. If the contemplated purchase of this line, which is electrically operated, is concluded, it will be necessary for this ten-mile gap to be spanned by new construction.

SALEM, ORE.—The Clackamas Power & Irrigation Co. has filed application to use 1000 second feet of water from Clackamas river to devel-

op 11,705 h.p. near Estacada. The proposed project will cost \$1,250,000. A fall of 300 ft. will be utilized and a ditch and flume 6.6 miles long and a dam 400 feet long will be built. At the same time application was filed by the Portland Railway, Light & Power Company for the storage of 40,400 acre-feet of water from Oak Grove creek to develop power along the Clackamas river. The cost of the storage reservoir is estimated at \$300,000.

YAKIMA, WASH.—The half completed Wapato project in the Yakima Indian reservation is now watering 71,000 acres, and when completed will water 120,000 to 125,000 acres, all of which, with the exception of 15,000 acres, will be reached by gravity flow. The 15,000 acres will be watered by pumps driven by electric power generated by "drops" in the reservation canals. The normal flow of the canal at these drops is capable, it is reported, of developing 10,000 horsepower, and it is likely that arrangements will be made by the department to sell the surplus power either to other departments of the government or to private consumers.

THE PACIFIC CENTRAL DISTRICT

FAIRFIELD, CAL.—An irrigation project is being promoted here by A. C. Gregory.

PORTERVILLE, CAL.—Plans are under consideration by the city council for the establishment of a municipal electric light plant.

SAN FRANCISCO, CAL.—Specifications for the cables and wires to be used in the installation of the new Broadway lighting system from California street to Tenth street have been approved by the Public Service Commission.

SOUTH SAN FRANCISCO, CAL.—The San Bruno board of trustees will be asked to explain the reason for the shortage of water in the city, and will be urged to make plans for a connection with the Spring Valley water mains to insure the necessary supply.

CHICO, CAL.—The irrigating season along the Western Canal has started, and already water is being supplied for about 4000 acres of rice land. When the irrigating season is at its height the big ditch will be supplying water to about 17,000 acres of valley land.

FRESNO, CAL.—Governor W. D. Stephens has signed the Iron Canyon bill, which will permit the consolidation of all water districts necessary for the formation of the Kings River conservation district, to carry through the big \$9,000,000 Pine Flat project for the irrigation of a million acres of land.

PALO ALTO, CAL.—The city council has made an appropriation of \$1000 to extend the city power lines to Seale Addition No. 5, the extension being necessary to furnish power to operate the irrigating plants on the various farms and tracts that are being developed in that locality.

TERRA BELLA, CAL.—State Engineer W. E. McClure reports that in Madera county an effort is being made to organize a district that will expend ten million dollars in watering 400,000 acres. The plans include a big dam on the San Joaquin river which will require from two to three years to build.

SAN FRANCISCO, CAL.—The Board of Public Works has awarded Healy & Tibbetts the contract for reconstructing the Union street line between Van Ness avenue and Franklin street,

their bid of \$2274 being the lowest. Eccles & Smith were given the contract for new trolley poles and wires. Their bid was \$1424.50.

CHICO, CAL.—Chico's petition for a valuation on the plants of the Northern California Power Company and the Pacific Gas & Electric Company for condemnation purposes, the first step toward municipal ownership, has been filed with the State Railroad Commission. The application will be submitted to the engineering department for immediate action.

SAN FRANCISCO, CAL.—The issue of Great Western Power Company \$3,000,000 first and refunding bonds offered to the public has been sold, according to information received by E. H. Rollins & Sons, local managers of the syndicate, from the six local firms participating in the retail offering. The bonds were sold at 95 and interest to yield 6½ per cent, an attractive rate that helped make them popular.

SAN FRANCISCO, CAL.—City Engineer M. M. O'Shaughnessy recommended to the Board of Works that the Supervisors be requested to call for bids for \$505,000 of water construction bonds of the 1910 issue, and if no bids are received, to place the bonds on sale over the counter at the treasurer's office. The money is needed to carry on the present program of work on the Hetch Hetchy project without interruption.

OAKDALE, CAL.—The South San Joaquin district has about completed its plans for a bond issue of \$500,000 for completion of its irrigation system, and of the Hiltz Sag flume. This was the largest wooden flume in the world, and is now being replaced by concrete. It is the intention of the board to complete the concrete work within five years, doing a fifth of the work each year. The improvements can be made only during irrigation seasons, because of the necessity for filling Woodward reservoir.

MAYFIELD, CAL.—Municipal ownership of electric and gas distributing systems was the subject discussed at the meeting of the Mayfield Chamber of Commerce. Representatives of Mountain View and Sunnyvale, who are considering the same question, were present. June 27 was set as the date when all three would vote on bonds for this system, providing that the necessary legislation could be completed in Mayfield, Sunnyvale and Mountain View are ready at the present time to put the issue to a vote.

REDDING, CAL.—The Northern California Counties Association, comprised of Shasta, Siskiyou, Trinity, Modoc and Lassen counties, has launched a campaign to obtain the construction of the Iron Canyon Irrigation Project of 225,000 acres under the canal diversion plan instead of under the dam and reservoir plan. The Shasta county membership contends that with the construction of a great dam as planned under the \$18,000,000 plan of construction outlined by the Sacramento Valley Development Association, water would be backed up over productive lands now under the Anderson-Cottonwood Irrigation District, just being completed, and would be forced into Anderson and Cottonwood.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—It is stated that the proposal to issue \$3,000,000 in bonds to build a municipal railroad from Pasadena to Los Angeles will be resubmitted to the voters at the earliest possible date. The commissioners have voted \$300 for a preliminary survey of routes.

HOLTVILLE, CAL.—Plans are under consideration by the Holton Power Company for installing electric generating equipment in the dismantled power house at Holtville. The cost is estimated at \$75,000 and it is estimated that 1000 h.p. can be developed. E. A. Judy is district manager.

HUNTINGTON BEACH, CAL.—The city council adopted a resolution providing for an election

to vote on the issuance of \$40,000 bonds to rebuild the municipal gas plant. J. M. Berkeley and Olmsted & Gillelen, associated engineers, Hollingsworth Building, Los Angeles, are preparing plans for the new plant.

SANTA ANA, CAL.—Application has been made by the Union Oil Company for permission to lay a pipe line from New Chapman gusher field at Yorba Linda to connect with the pipe line running to the harbor district. They also ask for a franchise for a private telephone system to connect various oil properties.

LOS ANGELES, CAL.—The Pacific Electric Railroad has ordered resumption of the Jighlan avenue service. The old road between Fountain and Vermont avenues and Hollywood Boulevard will be torn up, new 75-lb. T rails will be placed, the strip paved and all center poles removed to the sidewalk.

PHOENIX, ARIZ.—A company is being organized by the Phoenix Wholesale Meat & Produce Company, Fifteenth avenue and River street, and the Tribolet Packing Company of Bisbee, for the purpose of erecting a packing plant in Phoenix to include a refrigerating and ice-manufacturing plant.

LOS ANGELES, CAL.—Bids, it is reported, are being asked by the Keystone Iron Works, Merchants National Bank Building, Los Angeles, for the construction of its new plant on Santa Fe avenue, consisting of foundry, office building and a warehouse and service. The foundry will be equipped with furnaces and three electrically operated cranes.

PALMDALE, CAL.—An election will be called to vote \$600,000 bonds in the Palmdale irrigation district as soon as the project is approved by the state irrigation bond commission, according to Bert Cole, the engineer. Two storage reservoirs will be constructed in Little Rock Creek, each impounding about 7000 acre-feet of water. The water will be distributed by gravity in concrete pipes.

COVINA, CAL.—The board of directors of the Covina Citrus Association has authorized an expenditure of \$140,000 for the erection of a new precooling plant and packing works. Considerable electrical and mechanical equipment, including fans and blowers, industrial motors, refrigerating and ice-making apparatus, conveying and hoisting machinery and other appliances will be installed. W. W. Bennett is manager.

LOS ANGELES, CAL.—The Southern California Edison Company will install in Big Creek Plant No. 2, situated in Fresno county 240 miles from Los Angeles, an additional 2200 h.p. generator which will necessitate the construction of an additional pipe line requiring 100 tons of steel. Later a similar unit will be required at No. 1 power house under practically the same conditions. It is expected that the installation at Big Creek Plant No. 2 will be completed and put into commission at an early date.

THE INTER-MOUNTAIN DISTRICT

DEWEYVILLE, UTAH.—A committee of citizens has been conferring with the Utah Power & Light Company officials in an effort to secure electric service for the city. No definite agreement has yet been reached.

MILLVILLE, UTAH.—Not a single opposing vote was cast in the special bond election held in this city May 28th. The money derived from the sale of bonds will be used to light the town with electricity from the Utah Power & Light Company's system.

OGDEN, UTAH.—The Utah-Idaho Central Railroad Company have been asked to extend their street car lines into West Ogden, to take care of heavy traffic resulting from the establishment of a large number of big industrial plants, etc., in that section of the city.

TWIN FALLS, IDA.—The Farmers' Mutual Light & Power Company are contemplating

crossing the Snake River with their lines in order to serve the people on the North Side tract. If the extension is made, the town of Hansen and other surrounding country will be furnished with electric service.

DRUMMOND, IDAHO.—Considerable enthusiasm is being shown by this town in the effort to secure electric service. The town is planning to build its own distribution system and to purchase power at wholesale from one of the larger power companies. More than \$8000 has already been subscribed toward the building of the distribution system.

PROVO, UTAH.—The Mapleton Light & Power Company has filed articles of incorporation with the county clerk. The company is capitalized for \$2000, which is divided into 2000 shares of par value of \$1.00 each. Officers of the new company have not yet been chosen. The new company will furnish electric service for the town of Mapleton.

DUCHESNE, UTAH.—The citizens of this town, through the Commercial Club, are making strenuous efforts to secure electric service from the Uintah Power & Light Company. They are also negotiating with the Fork Milling & Power Company to increase its capacity and render service to the town. The first satisfactory offer by either company will be accepted by the town.

IDAHO FALLS, IDA.—The Osgood Land & Live Stock Company, formerly known as the Idaho Falls Dry Farming Company, is perfecting plans for the irrigation of 6800 acres on their tract just west of Idaho Falls. Irrigation machinery has already been ordered, all of which will be operated by electricity. This tract was formerly operated as a dry farm but without much success.

PAROWAN, UTAH.—Parowan and Paragonah will probably be furnished with electric service in the near future. Application for ten second feet of water from Red Creek in Iron county has been made by J. L. Lowder, to be used in producing current for Paragonah and the Parowan Mercantile Company has filed application for ten second feet of water to produce current to serve the town of Parowan.

SALT LAKE CITY, UTAH.—Application for 100 second feet of water to generate 800 horsepower has been made to the state engineer by the Sevier River Land & Water Company. The company proposes to take the water through the high line canal of the company and return it to the stream, about eighteen miles away, turning it over two 4-foot Francis type wheels under 120-foot head. The electricity developed would be used for lighting and power purposes in Lynndyl, Leamington, Oak City and Eureka.

MACKAY, IDA.—The Mackay Light and Power Company has filed a petition with the Public Utilities Commission, asking the commission to enjoin the Ashton-St. Anthony Power Company to enter into a contract with the village of Arce, Idaho, to transmit electric power to Arce, which the Mackay company holds to be in its field. Arce expects to bond for \$50,000 to build a power line to Mud Lake to connect with the Ashton-St. Anthony Power Company's lines.

IDAHO FALLS, IDA.—The Utah Power & Light Company have announced that they will immediately commence construction of a heavy transmission line from McCammon to Shelley, where it will connect with the company's present system serving the territory from Idaho Falls to Ashton. This line will enable residents of the Snake River valley in this section to secure power for pumping, etc., and will be of material aid in the development of the valley. The company will also construct another transmission line from Idaho Falls to St. Anthony. These lines will be constructed to take care of present and future requirements for both light and power.

THE VACUUM CLEANER

THE VACUUM CLEANER

THE DEFINITION OF A BOLSHEVIST is given as "a man who has nothing and wants to divide it with everybody." A similar generous impulse to divide is the motive back of this page, with the difference that it is not the vacuum which is here passed on, but the rich treasures which have been salvaged from the corners of the editorial desk. With apologies to the vacuum cleaner for the aspersions cast upon its character—it being a firm believer in private ownership for the public good—as a token of confidence, this page is hereby turned over unrestrictedly to its care.—The Editor.



Not for bread alone is the water power of ancient Thibet utilized—but for prayer as well. This is a Thibetan prayer mill, a great saver of time and human effort, which grinds out prayers with every turning of the wheel. If a small mill of this sort can effectively avert disaster from a Thibetan community, think what the great water powers of the West, properly harnessed, might accomplish in such little matters as world wars and telephone strikes.



Praying by Water Power

The Mexican revolution has had many strange effects—but why the apparent prejudice against mules? The Commerce Reports, not usually intended as humorous documents, report that "burros are being used to facilitate packing to mining districts in north-western Chihuahua. Their substitution for mules is due to political conditions." Speculate your own speculations.

The origin of free verse should be a subject of great interest to a group so poetically inclined as the electrical industry. Walt Whitman has been credited as its originator, but the recent investigations of Professor Kroeber of the University of California among the head-hunting tribe of Igorots indicate a more primitive source. Here is one of the Igorot poems—note the presence of the white man as indicated by the gentle hint of the last line:

I am a fish from the ocean; I am a fish from the ocean.
I am a fish from the shore; I am a fish from the shore.
I said, "I will go against the current"; I said, "I will go against the current."

The water, the flowing water; the water, the flowing water.
But muddy was the water; but muddy was the water.
For this reason, for this reason, for this reason.
I went against the current of two brooks; I went against the current of two brooks.
I found a pretty mate; I found a pretty mate.
But she would not return my love; but she would not return my love.
On account of my shame; on account of my shame.
Then tobacco I requested; then tobacco I requested.
A cigar I was given; a cigar I was given.

Daylight saving was first invented by the commuter who set his alarm clock ahead three minutes in order to catch the train and then, discounting the three minutes the clock was fast, took another cup of coffee and missed it. Here is a plaintive song which will strike to the heart of every suburban dweller who has on occasion turned on his other side and missed both his breakfast and his train.

RUBAIYAT OF A COMMUTER

Awake! for as the Stars begin to wane,
Sounds the Alarm that bids us rise again
And lo! we have but one brief Hour to dress,
And eat and put up Lunch and catch a Train.

Come fill the Cup; in some convenient Thing
The nearest Piece of Bread and Butter fill;
The Bird of Time has but a little way
To fly, and lo! the Bird is on the wing!

The early Train men set their Hearts upon*
Is swift above all others, and anon
Like some derisive Demon in a Race,
Hooting a scornful Hoot or two—is gone.

And those who left their Coffee in the Pot
And those who drank it while it was too hot,
Alike are stranded on the empty Street,
—Wishing they hadn't hurried such a lot.

The iron Beast that careth not a Bit
Moves on, nor all thy Piety nor Wit
Shall lure it back along the winding Track,
Nor all thy Tears restore one Car of it.

Ah me! could you and I with Hines conspire
To change this sorry Railroad Scheme entire,
We would install a dozen Trains an Hour,
Nor leave our Breakfast Toast upon the Fire.

D. E. E.

ENGINEERS OF YESTERDAY—II. BOYLE

(A Series Compiled by A. L. Jordan)



If a shaft were sunk so deep that the air at the bottom were four times as dense as at the earth's surface, what would be the atmospheric pressure at that depth?

According to Robert Boyle (B. Ireland, 1627) the pressure is inversely proportional to the volume; and if ordinary air is at 14.7 lbs. per sq. in. (as proved by Torricelli) the air at the bottom of the shaft, which is compressed to one-fourth its size, is under 58.8 lbs. per sq. in. This important law, which is very nearly exact for all gases under ordinary pressures, was published by Boyle in 1662 under the title "New Experiments Touching the Spring of the Air." He worked in other scientific lines and was one of the first to bring into prominence experimental methods and the need for laboratories. He was one of the most active founders of the Royal Society of England.

